Memorials of Adare

A

DISSERTATION

ON THE

FOOD

AND

DISCHARGES

OF

HUMAN BODIES.

By BRYAN ROBINSON, M. D.

PREFACE.

IN the following Differtation I have given an Account, from Experiments, of the Food and Difcharges of human Bodies. By the Statical Tables it appears, that in *England*, *Ireland*, and *South Carolina*, Perfpiration is confiderably greater in the Day than in the Night; whereas, by the Aphorifms of *Sanctorius*, the contrary

A 2   obtains

obtains in *Italy* ; for in feven Hours of quiet Sleep a Perfon there perfpires twice as much, as he does when awake in an equal Time. A firm Belief of this Doctrine of *Sanctorius*, and that it obtains in other Countries as *Sanctorius* affirms it does in *Italy*, has hurt many. For it is natural for Perfons thus perfuaded, when they awake in the Morning, and find any Moifture on their Skin, to be afraid of rifing left they fhould check Perfpiration, and to continue in Bed till the Moifture goes off of itfelf ; by which erroneous Conduct they relax and weaken their Conftitutions, and frequently become Valetudinarians, from being Perfons of naturally ftrong and healthful Bodies.

Sanctorius

Sanctorius feems to have had a different Opinion of the Proportion of Perfpiration to Urine at different Seafons of the Year, from what appears by our Tables. He feems not to have much regarded Urine in comparifon of Perfpiration; and yet they are not far from being equal in the whole Year, taking one Day, one Month, and one Seafon with another, as appears by Tables 2, 7, 9. And, what is very remarkable, Urine in the whole Year exceeds Perfpiration, not only in *England* and *Ireland*, but even in *South Carolina*, a Country much hotter than *Italy*.

But tho' *Sanctorius* may have advanced fome Things which are

A 3   not

not true, and fome which are true only under certain Circumftances, yet he is highly to be honoured for what he has done; and had he known the Circulation of the Blood, and been acquainted with true Philofophy, we may eafily grant, that he would not have left any thing material on this Subject to be done by others.

A

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AS the Difcharges of human Bodies depend upon, and are regulated by, the Motion of the Blood; fo it may be proper to premife a fhort Account of that Motion, by which the Nature of the Difcharges by Perfpiration, Urine, and Stool, will be more clearly underftood than they could be without it.

The Account here given of the Blood's Motion, is drawn from what I have delivered concerning it in the *Animal Oeconomy*, and from other Experiments and Obſervations. I ſhall, by way of Illuſtration, ſubjoin ſome Tables and Obſervations drawn from Experiments made on other Animals.

Of the Motion of the Blood.

IF a healthful Body be ſituated in a given manner with reſpect to the Horizon, the Velocity with which the Blood flows out of the left Venticle of the Heart into the Aorta, is in the ſubduplicate Ratio of the Diameter of the Aorta ; and if the Body be perfectly well proportioned, and its Heart be free from the Influences of all diſturbing Cauſes, the Velocity with which the Blood flows out of the Heart into the Aorta, is in the ſubquadruplicate Ratio of the Length of the Body ; by *Cor.* 4. *Prop.* 2. *Anim. Oecon.* And the Morning Number of Pulſes in a Minute of a healthful

Body,

Body, when it is fitting, and its Heart is free from the Influences of all difturbing Caufes, is as the Velocity of the Blood in the Aorta apply'd to the Length of the Body, by *Cor.* 1. *Prop.* 14; and if the Body be perfectly well proportioned, its Morning Number of Pulfes in a Minute is in the fubquadruplicate Ratio of the Length of the Body, apply'd to the Length of the Body. To exprefs thefe Proportions in Symbols, let D denote the Diameter of the Aorta in Inches and decimal Parts, when the Aorta is moderately diftended by the Syftole of the Heart; L the Length of the Body in Inches; P the Morning Number of Pulfes in a Minute, when the Body is fitting, and its Heart is free from the Influences of all difturbing Caufes; and V the Velocity with which the Blood flows out of the left Ventricle of the Heart into the Aorta, expreffed in the Inches it defcribes in a fecond Minute of Time; and then V will be as $D^{\frac{1}{2}}$, and P as $\frac{D^{\frac{1}{2}}}{L}$ in all healthful Bodies in the Morning, when the Bodies are fitting,

4 and

and their Hearts are free from the In-
fluences of all disturbing Causes; and V
will be as $L^{\frac{1}{4}}$, and P as $\frac{L^{\frac{1}{4}}}{L}$ in all healthful
and perfectly well proportioned Bodies un-
der the same Circumstances. Hence, if
we can find V and P in a healthful and
well proportioned Body of any one length,
we may find them by their Measures $L^{\frac{1}{4}}$
and $\frac{L^{\frac{1}{4}}}{L}$, in healthful and well proportion-
ed Bodies of all other Lengths in the
Morning, when the Bodies are sitting,
and their Hearts are free from the In-
fluences of all disturbing Causes.

The Velocity with which the Blood
flows out of the left Ventricle of the
Heart into the Aorta, may be found by
knowing the cubic Inches of Blood
which flow into the Aorta in one Systole,
the Orifice of the Aorta in square Inches
and decimal Parts of an Inch, and the
Time of one Systole in Seconds and deci-
mal Parts of a Second; for, putting K
for the cubic Inches of Blood which
flow

flow out of the Heart into the Aorta in one Syftole, O for the Orifice of the Aorta in fquare Inches and decimal Parts, and T for the Time of one Syftole in Seconds and decimal Parts of a Second, $\frac{K}{OT}$ will be equal to V. For $\frac{K}{O}$ is the Length defcribed by the Blood with the Velocity V in the Time T, and $\frac{K}{OT}$ is the Length defcribed with the fame Velocity in $1''$. For the Velocity being given, the Times are as the Spaces defcribed in thofe Times, that is, $T \cdot 1'' :: \frac{K}{O} \cdot \frac{K}{OT} = V$. The Time of one Syftole of the Heart in Seconds and Parts of a Second, may be found from the Number of Pulfes in a Minute, that is, T may be found from P. For allowing, what is generally fuppofed, the Time of one Syftole, to be but half the Time of a Diaftole, the whole Time of all the Syftoles, or all the Pulfes, in a Minute, will be only 20 Seconds. But if the Time of P Pulfes be 20 Seconds, the Time of one

Pulfe

Pulfe will be $\frac{20}{P}$, which Time is equal to T. And therefore, if $\frac{20}{P}$ be fubftituted inftead of T in the foregoing Meafure of the Velocity $\frac{K}{O T}$, we fhall have $\frac{K P}{20 O} = V$.

If 1500 Grains, or 5.6177 cubic Inches of Blood, flow out of the left Ventricle of the Heart into the Aorta in one Syftole, in a ftrong well proportion'd Man 72 Inches in Length, when his heart is free from the Influences of all difturbing Caufes; and if the Periphery of his Aorta when diftended by the Force of the Heart preffing out this Quantity of Blood, be 3.5 Inches; all which may be allowed as not exceeding the Truth; then putting D for the Diameter of the Aorta, we fhall have $D = 1.114085$, $D^2 = 1.241185$, $D^{\frac{1}{2}} = 1.0555$, and $O = 0.974824$. From fome Experiments, the Morning Pulfe of fuch a Man, when he is fitting and his Heart is free from the Influences of all difturbing Caufes, beats about 54 times in a Minute.

a Minute. This Number, though confiderably lefs than the Number affigned to ftrong well proportioned Bodies of that Length in the Table p. 136 of the *Animal Oeconomy*, yet I believe is much nearer the Truth, and may be allowed in Bodies which live regularly, and eat and drink but little at Night; for eating and drinking plentifully at Night commonly makes the Pulfe quicker the next Morning. The Number 65 in that Table, was a Mean taken from the Morning Pulfes of 120 Soldiers, and on that account might be greater than the Number correfponding to ftrong well proportioned Men of that Length, who live in a very regular and temperate manner. In fuch Bodies therefore K is 5,6177, P is 54, 20 × O is 19.496480, and $\frac{K\ P}{20\ O}$ is 15.48 Inches, equal to V. So that the Blood flows out of the Heart into the Aorta of ftrong well proportioned Men 72 Inches in length, when their Hearts are not influenced by difturbing Caufes, with a Velocity that carries it at the rate of 15.48 Inches in 1″.

This

This Velocity being found, the Velocity with which the Blood flows into the Aorta of a perfectly well proportioned Body of any other Length in the Morning, when the Body is fitting, and its Heart is free from the Influences of all difturbing Caufes, may be found by this Analogy. As 2.913 the biquadrate Root of 72, is to 15.48, the Velocity of the Blood flowing into the Aorta of a healthful well proportioned Body 72 Inches in Length, in the Morning, when the Body is fitting, and its Heart is free from the Influences of all difturbing Caufes; fo is the biquadrate Root of the Length of any other healthful well proportioned Body, in the fame Situation and fame undifturbed State of the Heart, to the Velocity with which the Blood flows into the Aorta of that Body; that is, $2.913 : 15.48 :: L^{\frac{1}{4}}. V$; whence $5.314 L^{\frac{1}{4}} = V$. By this Meafure of V, the Numbers in the Column V of Table 1. were computed. The Numbers in the Column P of the fame Table, were computed by a Meafure formed from this

Analogy;

Analogy : as 0.04472 the biquadrate Root of 63 divided by 63, is to 60 the Morning Number of Pulfes in a Minute of a healthful well proportioned Body 63 Inches in Length, when the Body is fitting and its Heart is free from the Influences of all difturbing Caufes ; fo is the biquadrate Root of the Length of any other healthfel well proportioned Body divided by that Length, to the Morning Number of Pulfes in a Minute, when the Body is fitting, and its Heart is free from the Influences of all difturbing Caufes ; that is, $0.04472 : 60 :: \frac{L^{\frac{1}{4}}}{L} : P$. Whence, $1341.7 \times \frac{L^{\frac{1}{4}}}{L} = P$. And the Numbers in the Column F were computed by a Meafure formed from this Analogy, $63 \times 63^{\frac{1}{4}} = 177.4899 : 56 :: L \times L^{\frac{1}{4}}. F :$ Whence $0.3155 \times L \times L^{\frac{1}{4}} = F$. Thefe Meafures of V, P and F, may be allowed in healthful well proportioned Bodies, whofe Hearts are not influenced by difturbing Caufes.

TABLE

L	L¼	V	L¼/L	P	L × L¼	F
7-	2 9130	15.4	0.04046	54	209.7360	66.17
70	2.8925	15 37	0.04132	55	202.4750	63.88
68	2.8716	15 26	0 04223	57	195.2688	61.60
66	2.8503	15.15	0.04319	58	188.1198	59.35
64	2.8284	15 03	0.04419	59	181.0176	57,11
63	2 8173	14 9	0.04472	60	177.4899	56.00
62	2.8060	14.91	0 04526	61	173 9782	54.89
60	2.7830	14 79	0.04638	6:	166.9860	52.68
58	2.7596	14.66	0.04758	64	160.0568	50.50
56	2 7355	14.54	0 04885	66	153 1880	48.33
54	2.7108	14 41	0.05020	67	146.3832	46.18
52	2.6854	14 27	0 05164	69	139.6408	44 06
50	2.6592	14.13	0 05318	71	132.9550	41.95
48	2.6322	13 99	0.05483	74	126.3456	39.86
46	2.6043	13.84	0 05661	76	119.7978	37.80
44	2 5755	13.69	0 05853	79	113.3220	35.75
42	2.5456	13 53	0.06061	81	106.9194	33.73
40	2.5149	13.36	0.06287	84	100.5960	31.74
38	2.4828	13.19	0 06534	88	94.3464	29.77
36	2.4495	13.02	0.06804	91	88.1820	27.82
34	2.4147	12.83	0 07102	95	82.0998	25.90
32	2.3784	12.64	0 07432	100	76.1088	24.01
30	2.3403	12.44	0.07801	105	70 2090	22.15
28	2.3003	12.2	0 08215	110	64.4084	20.32
26	2.2581	12.00	0.08685	117	58.7106	18 52
24	2.2134	11 76	0 09222	124	53.1192	16.76
22	2.1658	11.51	0.09844	132	47.6454	15.03
20	2.1147	11.24	0.10573	142	42.2940	13.34
18	2.0598	10.95	0.11443	154	37.0746	11.70
16	2.0000	10 6	0.12500	168	32.0000	10.10
14	1.9343	10.2	0.13816	185	27.080	8.54
12	1.8612	9 89	0 15510	208	22.3344	7 05

The

The Velocity, with which the Blood flows out of the left Ventricle of the Heart into the Aorta of a healthful Body, when it is fitting, and its Heart is free from the Influences of all difturbing Caufes, being univerfally as the fquare Root of the Diameter of the Aorta; that is, V being univerfally as $D^{\frac{1}{2}}$; and V and $D^{\frac{1}{2}}$ in a well proportioned Body 72 Inches in Length, being 15.48 and 1.0555; the Velocity, with which the Blood flows into the Aorta of any other healthful Body under the fame Circumftances, may be found by this Analogy. $15.48 : 1.0555 :: V : D^{\frac{1}{2}}$. Whence $14.667 \, D^{\frac{1}{2}} = V$.

The difturbing Caufes of the Motion of the Heart are Changes in the fenfible Qualities of the Air, Heat and Cold, Drynefs and Moifture, Errors in Food, in Exercife of Body, in the Times of fleeping and waking, and the Paffions of the Mind; that is, a wrong Ufe of the *Non-naturals* is the common difturbing Caufe of the Motion of the Heart.

B   TABLE

TABLE 2.

W	. w	: : 24	.	I
H	. h	: : 16	.	I
L	. l	: : 4	.	I
D	. d	: : 2	.	I
P	. p	: : 7	.	20
V	. v	: : 7	.	5
Q	. q	: : 28	.	5

In *Table* 2 are exhibited, the Propor-
tions of the Weights of the Bodies, of a
healthful ftrong well proportioned Man,
and a healthful ftrong well proportioned
Child newly born ; the Proportions of
the Weights of their Hearts, of the
Lengths of their Bodies, of the Diame-
ters of their Aortas, of their Pulfes in a
Minute when their Hearts are free from
the Influences of difturbing Caufes, of the
Velocities of the Blood in their Aortas,
and of the Quantities of Blood which in
a given Time flow through their Hearts
or Lungs, when their Hearts are not af-
fected by difturbing Caufes. And from
thefe Proportions compared with one
<div align="right">another</div>

another will arife fome ufeful Obferva-
tions.

Obf. 1. The Weight of the Heart with
refpect to the Weight of the Body, is
greater in Children than in grown Bodies.
It was greater in the Child than in the
Man, in the Proportion of 3 to 2. For,

$$\frac{h}{w} \cdot \frac{H}{W} :: 1 \cdot \frac{16}{24} :: 3 \cdot 2.$$

Hence the Weight of the Heart with
refpect to the Weight of the Body, lef-
fens continually from the Birth till Bodies
come to their full Growth.

Obf. 2. The Quantity of Blood which
flows through the Heart or Lungs in a
given Time, in Proportion to the Weight
of the Heart, or Quantity of Blood con-
tained in the Body, which Quantity of
Blood is proportional to the Weight of
the Heart, is greater in Children than in
grown Bodies. It was greater in the
Child than in the Man, in the Proportion
of 20 to 7. For $\frac{q}{h} \cdot \frac{Q}{H} :: \frac{5}{1} \cdot \frac{28}{16} :: 20 \cdot 7,$

which

which is the Proportion of their Pulfes in a Minute.

Hence, the Quantity of Blood that flows through the Heart or Lungs in a given Time, in Proportion to the whole Quantity of Blood contained in the Body, leffens continually from the Birth till Bodies arrive at their full Growth.

Obf. 3. The Velocity of the Blood with refpect to its Quantity, which Quantity is as the Weight of the Heart, is much greater in Children than in grown Bodies ; it was greater in the Child than in the Man, in the Proportion of 80 to 7. For $\frac{v}{h} \cdot \frac{V}{H} :: \frac{5}{1} \cdot \frac{7}{16} :: 80 . 7.$

Hence, though the Blood of Children moves flower than the Blood of grown Bodies, yet for its Quantity it moves much quicker, and much oftener paffes through the Lungs. On which account the Blood of Children, notwithftanding the Slownefs of its Motion, may by paf-

fing

ling oftener through the Lungs, and thereby receiving more of the Acid of the Air in proportion to its Quantity, be more fluid, and of a brighter Colour, than the Blood of grown Perfons.

Obf. 4. The Quantity of Blood that flows through the Heart or Lungs in a given Time, in Proportion to the Weight of the Body, is greater in Children than in grown Bodies. It was greater in the Child than in the Man in the Proportion of 30 to 7. For $\frac{q}{w} . \frac{Q}{W} : : \frac{5}{1} . \frac{28}{24} : : 30 . 7.$

Hence, though the Velocity of the Blood is lefs in Children than in grown Bodies, yet its Motion with refpect to the Weight of the Body is greater.

Obf. 5. The Velocity of the Blood with refpect to the Length of the Body, is greater in Children than in grown Bodies. It was greater in the Child than in the Man, in the Proportion of 20 to 7,

which

which is the Proportion of their Pulfes in a Minute. For $\frac{v}{l} \cdot \frac{V}{L} :: \frac{5}{1} \cdot \frac{7}{4} :: 20 \cdot 7.$

Hence, the Velocity of the Blood, and Number of Pulfes in a Minute, with refpect to the Length of the Body, leffen continually in growing Bodies till they arrive at their full Growth.

Several other Obfervations may be made from comparing the Proportions of this Table with one another.

To form fome Idea of the flow Motion of the Blood in the capillary Blood-veffels, we muft know the Bignefs of the red Corpufcles of healthful arterial Blood, and the Order of Colours in the Table p. 88. of the *Differtation on the Æther of Sir Ifaac Newton*, to which Order the red Colour of thofe Corpufcles belongs. To know the Bignefs of the red Corpufcles of healthful arterial Blood, we muft allow for their Denfity, which by Doctor *Jurin's* Experiments, is 1.126, the Denfity of Water being 1.

For

For were thofe Corpufcles tranfparent,
their Denfity is fuch, that the Sine of In-
cidence upon them would be to the Sine
of Refraction, as $\sqrt{2.126} = 1.4581$, is to
1, by *Cor. Prop.* 9. of the *Differtation.*
And therefore the Thicknefs of the Cor-
pufcles, that they may exhibit the fame
red Colour with thofe of Bubbles of Water
of the firft Order in the Table, muft be
lefs than the Thicknefs of the Skins of
thofe Bubbles in the Proportion of 1 to
1.4581. And confequently D, which I
put for the Thicknefs of the Corpuf-
cles, will be equal to $\frac{1}{148148} \times \frac{1}{1.4581} =$
0.00000046293 Part of an Inch. The
Diameter of the fmalleft Blood-veffel
muft be greater than the Thicknefs of a
Corpufcle, to let a Corpufcle pafs through
it; I fhall fuppofe it to be twice as great,
and then the Diameter of the fmalleft
Blood-veffel will be the 0.00000092586
Part of an Inch, and the fquare Root of
this Diameter will be the 0.0009636 Part
of an Inch, which being multiply'd into
14.667, gives the 0.014 Part of an Inch
for

for the Space defcribed by the Blood in
a capillary Blood-veffel in a Second of
Time.   With this Velocity the Blood
moves at the Rate of 50.4 Inches in an
Hour.   The Velocity of the Blood in the
Aorta of a ftrong well proportioned Man
72 Inches in length, is above 1100 times
greater than the Velocity of the Blood in
a capillary Blood-veffel; and it is above
780 times greater in the Aorta of a ftrong
well proportioned Child 18 Inches in
length, than it is in a capillary Blood-
veffel.   This flow Motion of the Blood
in the capillary Veffels is what qualifies
it for Secretion.

That the Colour of healthful arterial
Blood is the Red of the firft Order, and
that the Colour of healthful venal Blood
is compofed of the Violet and Indigo of
the fecond Order, appears to me very
probable from the following Confidera-
tions.   The Colour of venal Blood in an
inflammatory Fever, when drawn and
expofed to the Air, firft changes into a
very faint Blue, and then into a White,

or

or Yellowiſh White like the Colour of Buff. Theſe Changes ſhew, the Colour of this venal Blood to be the Beginning of Black of the firſt Order, and that its tinging Corpuſcles are enlarged by the Acid of the Air. This Effect of the Acid of the Air on this venal Blood, is directly contrary to the Effect it produces in healthful venal Blood; for it changes its dark Colour into a good Red, without making it paſs through the intermediate Colours of Blue, Green, Yellow and Orange; and therefore the Red into which it changes it, muſt be the Red of a ſuperior Order; which ſhews that its tinging Corpuſcles are leſſened by the Acid of the Air. The Red into which the Colour of healthful venal Blood changes when expoſed to the Air, muſt be the Red of the firſt Order; for if it was the Red of the ſecond Order, as I ſuppoſed in the *Animal Oeconomy*, then the Change of the Colour of venal Blood, compoſed of the Purple and Indigo of the third Order, into the Beginning of Black of the firſt Order the Colour of

inflam-

inflammatory venal Blood, would be a Change too great to be admitted. But if the Colour of healthful venal Blood be compofed of the Violet and Indigo of the fecond Order, it may be changed by the Heat and Motion of the Blood in an inflammatory Fever, into the Beginning of Black in the firft Order without any Inconvenience, and therefore may be allowed.

Hence, the Acid of the Air has a different Effect on the venal Blood in inflammatory Fevers, from what it has on the venal Blood in Health; it enlarges the tinging Corpufcles of the firft, and leffens the tinging Corpufcles of the fecond. Black being the Colour which Bodies put on, when the Corpufcles on which their Colours depend are divided into fmaller Particles by Putrefaction; and the Colour of venal Blood in inflammatory Fevers being much nearer to Black, than the Colour of venal Blood in Health; we may hence conclude, that venal Blood in inflammatory Fevers, is

nearer

nearer to a State of Putrefaction than venal Blood in Health ; and that the Acid of the Air has the fame Effect upon venal Blood in inflammatory Fevers, as it has upon the Parts of Bodies diffolved by Putrefaction. All this will be readily conceived from Sir *Ifaac Newton's* Account of the Compofition of Particles of Salt, which I fhall give in his own Words.

" As Gravity makes the Sea flow " round the denfer and weightier Parts " of the Globe of the Earth, fo the At- " traction may make the watry Acid " flow round the denfer and compacter " Particles of Earth for compofing the " Particles of Salt. For otherwife the " Acid would not do the Office of a " Medium between the Earth and com- " mon Water, for making Salts diffolvable " in Water ; nor would Salt of Tartar " readily draw off the Acid from dif- " folved Metals, nor Metals the Acid " from Mercury. Now as in the great " Globe of the Earth and Sea, the " denfeft Bodies by their Gravity fink

" down

" down in Water, and always endeavour
" to go towards the Center of the Globe;
" so in Particles of Salt, the denseſt Mat-
" ter may always endeavour to approach
" the Center of the Particle : So that a
" Particle of Salt may be compared to a
" Chaos ; being denſe, hard, dry, and
" earthy in the Center ; and rare, ſoft,
" moiſt, and watry in the Circumference.
" And hence it ſeems to be that Salts are
" of a laſting Nature, being ſcarce de-
" ſtroyed, unleſs by drawing away their
" watry Parts by Violence, or by letting
" them ſoak into the Pores of the central
" Earth by a gentle Heat in Putrefaction,
" until the Earth be diſſolved by the
" Water, and ſeparated into ſmaller Par-
" ticles, which by reaſon of their Small-
" neſs make the rotten Compound appear
" of a black Colour. Hence alſo it may
" be that the Parts of Animals and Ve-
" getables preſerve their ſeveral Forms,
" and aſſimilate their Nouriſhment ; the
" ſoft and moiſt Nouriſhment eaſily
" changing its Texture by a gentle Heat
" and Motion, till it becomes like the
                              " denſe,

" denfe, hard, dry, and durable Earth
" in the Center of each Particle. But
" when the Nourifhment grows unfit to
" be affimilated, or the central Earth
" grows too feeble to affimilate it, the
" Motion ends in Confufion, Putrefaction,
" and Death."

I now proceed to give an Account of
the Difcharges and Food of human Bo-
dies.

Of the Food and Difcharges of Human
Bodies.

PROPOSITION I.

THE Sum of the Difcharges by Per-
fpiration, Urine, and Stool in a na-
tural Day or any other Time, is equal to
the Quantity of Food taken in that Time,
leffened by the Difference of the Weights of
the Body at the beginning and end of the
Time, if the Body be heavier at the end

of the Time than at the beginning ; and increafed by that Difference, if the Body be lighter. If p, u, *and* s *denote the Quantities of Perfpiration, Urine, and Stool difcharged in a natural Day or any other Time,* F *the Quantity of Food taken in that Time, and* d *the Difference of the Weights of the Body at the beginning and end of the Time ; then* $p + u + s = F + d$, *when the Body is lighter, and* $p + u + s = F - d$, *when the Body is heavier, at the end of the Time than at the beginning.*

For if a Body be of the fame Weight at the beginning and end of a natural Day or any other Time, the Sum of the Difcharges made by Perfpiration, Urine, and Stool, will be equal to the Quantity of Food taken, in that Time. But if the Weight of the Body be greater or leffer at the beginning of the Time than at the end of it, the Sum of the Difcharges will fall fhort of or exceed the Food by the Difference of thofe Weights. And therefore, that Difference muft be added to the Food when the Difcharges

3   exceed

exceed the Food, and fubducted from the Food when the Food exceeds the Difcharges ; that is, d muft be added to F in the firft Cafe, and fubducted from F in the fecond, to make $p + u + s = F + d$ when the Body is lighter, and $p + u + s = F - d$ when the Body is heavier at the end of the Time than at the beginning. Therefore the Propofition is true.

Cor. 1. The Quantity of Perfpiration in a natural Day or any other Time, is equal to the Sum of the Food and Difference of the Weights of the Body at the beginning and end of the Time, leffened by the Quantities of Urine and Stool in that Time, when the Body is lighter at the end of the Time than at the beginning ; and equal to the Food leffened by the Difference of the Weights of the Body, and by the Quantities of Urine and Stool in that Time, when the Body is heavier at the end of the Time than at the beginning : that is, $p = F + d - u - s$ when the Body is lighter, and $p = F - d - u - s$ when the Body is heavier.

Hence,

Hence, by knowing F, d, u and s, all which may be had by weighing, the Quantity perspired in any Time, whatever that Time be, may be found by this Corollary.

Cor. 2. If a Body be of the same Weight at the End of a natural Day or any other Time, as at the Beginning; the Sum of the Discharges, and Quantity of Food, in that Time, will be equal; and Perspiration will be equal to the Food, lessened by the Quantities of Urine and Stool. If d be o, then $p + u + s = F$; and $p = F - u - s$.

Cor. 3. If no Food be taken between the two Times of weighing the Body, or, in other Words, if the Person fasts during the intermediate Time; the Sum of the Discharges by Perspiration, Urine, and Stool in that Time, will be equal to the Difference of the Weights of the Body at the Beginning and End of the Time; and Perspiration will be equal to that Difference

ference leffened by the Quantities of Urine and Stool. For F being o, and d being affirmative, becaufe the Body is necef-farily lighter at the End of the Time than at the Beginning; $p + u + s = d$, and $p = d - u - s$.

Cor. 4. If the Perfpiration and Urine difcharged in a natural Day or any other Time be equal, and the Body be of the fame Weight at the end of the Time as at the beginning; double the Quantity of Perfpiration added to the Stool will be equal to the Food; and the Quantity of Perfpiration will be equal to half the Dif-ference of the Food and Stool. If $p = u$, and d be o; then $2p + s = F$, and $p = \dfrac{F - s}{2}$.

Cor. 5. If a Body, by taking a given Quantity of Food in a natural Day, be of the fame Weight at the end of the Day as at the beginning; the Sum of Perfpi-ration, Urine, and Stool difcharged in that Time, will be given. If d be o, and

C   F be

F be given, or as 1 ; p ─┼─ u ─┼─ s will be given, or as 1. When this Corollary obtains, if one of the three Discharges be increased or lessened, one or the Sum of the other two will be equally lessened or increased ; otherwise the Sum of the three could not be given.

PROPOSITION II.

THE Sum of the Discharges by Per-spiration, Urine, and Stool, in a natural Day or any other Time, is nearly proportional to the mean Quantity of Blood, which in that Time flows out of the Heart into the Aorta in one Systole, and the Number of Systoles or Pulses in the same Time, taken together. If q *denote the mean Quantity of Blood, which in a natural Day or any other Time, flows out of the Heart into the Aorta in one Systole, and* N *the Number of Pulses in that Time, then will* p ─┼─ u ─┼─ s *be nearly proportional to* q N.

For the secerning Ducts, which draw off the Humours of Perspiration and
Urine

Urine from the Blood, are Continuations of the Blood-veffels, and differ from them only in this, that they are too fmall to let the red Parts of the Blood, which are its largeft Parts, pafs through them ; and therefore, the Sum of thefe two Humours flowing through thefe fmall Ducts in a natural Day or any other Time, will be proportional to the Quantity of Blood that flows out of the Heart into the Aorta in that Time. But the Quantity of Blood which flows out of the Heart into the Aorta in a natural Day or any other Time, is equal to the mean Quantity thrown out of the left Ventricle in one Syftole, and Number of Syftoles or Pulfes in that Time, taken together. And therefore, the Sum of Perfpiration and Urine in a natural Day or any other Time, will be proportional to the mean Quantity of Blood thrown into the Aorta in one Syftole, and Number of Syftoles or Pulfes in that Time, taken together ; that is, $p + u$ will be proportional to q N. Stool is a very inconfiderable Difcharge when compared with Perfpiration and Urine; and on that

account

account will but little increafe their Sum
when added to it. And confequently,
p + u + s will be nearly proportional to
�q N.

Cor. If the fame Quantity of Blood,
flows out of the Heart into the Aorta in
a natural Day, or any other Time ; the
Sum of the Difcharges by Perfpiration,
Urine, and Stool in that Time, will be
nearly the fame. If q N be given, p +
u + s will be nearly given.

�q N will be given, when both q and
N are given, or when q is as $\frac{1}{N}$. And
when q N is given, p + u + s will be
nearly given, or nearly as 1. And con-
fequently, when any one of the three
Difcharges is increafed or leffened, one, or
the Sum of the other two, will be leffen-
ed or increafed nearly equally ; otherwife
their Sum could not be nearly given, or
nearly as 1.

PROPOSITION III.

THE *Quantity of Food taken in a natural Day or any other Time, increased by the Difference of the Weights of the Body at the beginning and end of the Time, when the Body is lighter at the end of the Time than at the beginning; and lessened by that Difference, when the Body is heavier, is nearly proportional to the Quantity of Blood which flows out of the left Ventricle of the Heart into the Aorta in that Time; that is,* $F + d$ *is nearly proportional to* qN, *when the Body is lighter at the end of the Time than at the beginning; and* $F - d$ *is nearly proportional to* qN, *when the Body is heavier.*

For $p + u + s = F + d$, when the Body is lighter, and $p + u + s = F - d$, when the Body is heavier, at the end of the Time than at the beginning; by *Prop.* 1. And $p + u + s$, is nearly proportional to qN; by *Prop.* 2. And therefore, $F + d$ is nearly proportional to qN when the

Body

Body is lighter, and F—d is nearly proportional to q N when the Body is heavier, at the end of the Time than at the beginning.

Cor. 1. If a Body be of the same Weight at the end of a natural Day or any other Time, as at the beginning; the Quantity of Food taken in that Time, will be nearly proportional to the Quantity of Blood, which flows out of the Heart into the Aorta in the same Time. If d be o, F will be nearly proportional to q N.

Cor. 2. If a Body be of the same Weight at the end of a natural Day or any other Time, as at the beginning; and if during that Time, the mean Quantity of Blood flowing out of the Heart into the Aorta in one Syftole be given; the Quantity of Food taken in that Time, will be nearly proportional to the Number of Pulfes in the same Time. If d be o, and q be given; F will be nearly proportional to N.

Cor. 3. If the mean Quantity of Blood, which in a natural Day or any other Time flows out of the Heart into the Aorta in one Syftole, be reciprocally proportional to the Number of Pulfes in that Time, and if the Body be of the fame Weight at the end of the Time as at the beginning ; then will the Quantity of Food be nearly given. If q be as $\frac{1}{N}$, and d be o, F will be nearly as 1.

Cor. 4. If the Heart during a natural Day or any other Time, throws the fame Quantity of Blood into the Aorta in each Syftole ; if the Number of Pulfes in that Time, be proportional to the Morning Number of Pulfes in a Minute when the Body is fitting, and its Heart is free from the Influences of all difturbing Caufes ; and if the Body be of the fame Weight at the end of the time as at the beginning ; then will the Quantity of Food taken in that Time, be nearly proportional to the Morning Number of Pulfes

in a Minute when the Body is fitting, and its Heart is free from the Influences of all difturbing Caufes. If q be given, N be as P, and d be o; F will be as P.

I now proceed to an Explanation of the following Statical Tables, and Tables of Animals. But before I do this, I fhall mention a few Particulars relating to myfelf.

I am now, in *May* 1747, in the 68th Year of my Age. The Length of my Body is 63 Inches : I am of a fanguin but not robuft Conftitution, and at prefent am neither lean nor fat. In the Year 1721, the Morning Weight of my Body without Cloaths was about 131 Averdupois Pounds, the daily Quantity of my Food at a Medium was about 85 Averdupois Ounces, and the Proportion of my Drink to my Meat, I judge was at that Time about 2.5 to 1. At the latter end of *May* 1744, my Weight was above 164 Pounds, and the Proportion of my Drink to my Meat was confiderably greater than before, and had been fo for fome Time.

Time. I was then feized with a paraly-tick Diforder, which obliged me to make an Alteration in my Diet. In order to fettle the Proportion of my Drink to my Meat, I confidered what others have faid concerning this Proportion. According to *Sanctorius*, though he reckons it a Dif-proportion, the Drink to the Meat in his Time, was above 10 to 3 in temperate Bodies, *Aph.* 68. *Sect.* 3. *Cornaro's* Drink to his Meat, was as 7 to 6 ; Mr. *Rye's* in Winter, as 4 to 3 ; Dr. *Lining's* at a Me-dium for a whole Year, as 11 to 3 ; and my Drink to my Meat, as 5 to 2. A Mean taken from all thefe makes the Drink to the Meat to be as 2176 to 1000, which is above 2 to 1. I kept near to the Proportion of 2 to 1 in the Experiments, from which I compofed Table 2. In 17 Months, from the Time I was feized to the End of *October* 1745, I loft above twenty Pounds of my Weight, and above twice as much in the firft five Months as I did in the twelve Months after. To this Lofs of Weight, caufed chiefly, by the Regulation of my Diet, I impute my Recovery from

my

my laft Diforder, excepting which, and a Vertigo I had about ten or twelve Years before, I have had no Diforder of Confequence, or that confined me, fince I was a Boy.

Explanation of the Tables.

TABLE 1 is the fame with the Table publifhed in the *Animal Oeconomy*, p. 259, and contains the daily Food and daily Difcharges taken at a Medium from the Experiments of eight Months, beginning with *April* the laft of the Spring Months, and ending with *November* the firft of the Winter Months. In this Table the natural Day was divided into three Parts, Morning, Afternoon, and Night; the Morning contained fix Hours from eight to two, the Afternoon fix Hours from two to eight, and the Night the remaining twelve Hours. The Day made up of Morning and Afternoon, was equal to the Night. I obferved the Food and Difcharges in thefe three Parts of the natural Day, every Day for eight Months, and

and with the Means taken from all the
Food and all the Difcharges in the feve-
ral Months, I compofed this Table. The
Numbers expreffing the Food and the
Difcharges are Averdupois Ounces. p ex-
preffes the mean Quantity of Perfpiration,
and u the mean Quantity of Urine, dif-
charged daily in each Month; and confe-
quently, the Numbers in the Column
$\frac{p}{u}$, both in this and all the following
Tables, exprefs the Proportions of Perfpi-
ration to Urine in the feveral Months, or
exprefs Perfpiration, Urine being always
expreffed by 1; for Inftance, Perfpiration
was to Urine in *April*, as 0.904 to 1, or
as 904 to 1000; and in *Auguft* Perfpira-
tion was to Urine, as 1.713 to 1, or as
1713 to 1000. This Table was made in
the Year 1721.

Table 2 was made from the Experi-
ments of a whole Year, beginning the
firft of *November* 1744, and ending with
October 1745. In this Table the Day
contained the Hours of my being up, and
5 the

the Night the Hours of my being in Bed. For the firft feven Months to the Beginning of *June*, the Time of my being up was fifteen Hours, and the Time of my being in Bed nine Hours; and for the laft five Months to the End of *October*, the Time of my being up was 14.5 Hours, and the Time of my being in Bed 9.5 Hours. The Food and Difcharges in this and all the other Tables, are expreffed in Averdupois Ounces. For whenever any other Ounce was ufed, as the *Venetian* Ounce in *Italy* by *Sanctorius*, and the Troy Ounce in *South Carolina* by Dr. *Lining*, I reduced it to the Averdupois Ounce, for the more eafy comparing of the Quantities of Food, and Quantities of the Difcharges, of Perfons living in different Climates. The *Venetian* Pound, according to Mr. *Greaves*, contains 5528 Grains, and the *Venetian* Ounce $460\frac{2}{3}$ Grains; Dr. *Lining's* Pound contains 16 Troy Ounces, or 7680 Grains; and the Averdupois Pound ufed by Dr. *Kiell*, Mr. *Rye*, and myfelf, contains 7000 Grains, and the Ounce $437\frac{1}{2}$ Grains.

Table

Table 3 confifts of two Parts. The firft Part was made from *Table* 1, and the fecond Part from *Table* 2. Each Part contains the mean Quantities of Food taken daily in the feveral Months and Seafons of the Year ; and the mean Quantities of Urine and Perfpiration, which were drawn off from the Blood hourly in the Day and in the Night. In the firft Part of the *Table*, the Day was twelve Hours, and the Night twelve Hours ; and confequently T was 12 both Day and Night. In the fecond Part of the *Table*, the Day and Night being the Times of my being up and in Bed, which were 15 and 9 in the firft feven Months, and 14.5 and 9.5 in the laft five Months ; T was 15 in the Day, and 9 in the Night in the firft feven Months ; and 14.5 in the Day, and 9.5 in the Night, in the laft five Months. For Example, the mean Quantity of Urine difcharged daily in *November*, was 20.4 Ounces in the firft Part of the *Table*, and 17.96 Ounces in the fecond Part ; and dividing 20.4 by 12, and

17.96

17.96 by 15, we have 1.700, and 1,197, the mean Quantities of Urine difcharged hourly in the Day in that Month. And the mean Quantity of Perfpiration dif-charged daily in that Month was 17.63 in the firft Part of the *Table*, and 20.32 in the fecond Part; and dividing 17.63 by 12, and 20.32 by 15, the Quotients 1.470 and 1.355 will be the mean Quantities of Perfpiration difcharged hourly in the Day in that Month. In like manner were got the mean hourly Difcharges of Urine and Perfpiration in the Night : And thus the whole *Table* was formed.

Table 4 is the fame with the *Table* in p. 277. of the *Animal Oeconomy*, and con-tains the mean Quantities of Perfpiration and Urine which were actually difcharged hourly by two Perfons B and D, myfelf and another, in four very hot Days in Summer, beginning at fix in the Morn-ing, and ending at ten at Night. The Numbers correfponding to fix in the Morning, were the Quantities of Perfpi-ration and Urine which were drawn off
from

from the Blood in every Hour of the Night, taking one Hour with another. We both eat our Breakfaſt at eight in the Morning, dined at two, and ſupped at eight at Night. The mean Quantities of our daily Food in theſe four Days, were 86 and 63 Averdupois Ounces. We both kept within, and uſed no Exerciſe during that Time.

Table 5 was made from *Table* 4., and contains the mean Quantities of the Food of B and D in a natural Day ; and the mean Quantities of Perſpiration and Urine, and the Proportion of the mean Quantity of Perſpiration to the mean Quantity of Urine, in the three equal Parts of the natural Day, Morning, Afternoon, and Night; ſuppoſing the Morning to begin at ſix and end at two, the Afternoon to begin at two and end at ten, and the Night to begin at ten and end at ſix next Morn-ing.

Table 6 was made from the particular Tables of the Months, from the Means

of

of which Tables I compofed Table 2 ; and it contains feveral of the moft remarkable Changes of my Weight, together with my Food and Difcharges on thofe Days in which the Changes happened. The firft Column contains the Names of the Months; the fecond contains the Days of the Months on which the Changes happened ; the third contains the Quantities of Food taken on thofe Days; the fourth contains the Gain or Lofs of Weight, Gain being denoted by ⎯, and Lofs by ╂; the fifth contains the Sum of the Difcharges on thofe Days by Perfpiration, Urine, and Stool, which Difcharges are fet down feparately in the fixth, feventh, and eighth Columns ; and the ninth Column contains the Proportion of Perfpiration to Urine.

Tables 7, 8, 9, are the yearly *Tables*, of Dr. *Keill* at *Northampton* in *England*, of Mr. *Rye* at *Cork* in *Ireland*, and of Dr. *Lining* at *Charles-town* in *South Carolina*. In Dr. *Lining*'s Table, d and n exprefs Day and Night ; and p and u Perfpira-

tion

tion and Urine as in the other *Tables* ; for Inftance, $\frac{d\ u}{n\ u}$ exprefles the Proportion of the Day's Urine to the Night's Urine, and $\frac{d\ p}{n\ p}$ the Proportion of the Day's Perfpiration to the Night's Perfpiration. I have reduced his Degrees of Heat to the Scale of Sir *Ifaac Newton*.

Table 10 contains the Quantities of Food in Averdupois Ounces, and the Proportions of Perfpiration to Urine in the four Seafons of the Year, in *Italy, England, Ireland,* and *South Carolina.*

Sanctorius tells us, that if the Meat and Drink of one Day be eight Pounds, infenfible Perfpiration is wont to rife to about five Pounds. *Aph.* 6. *Sect.* 1. And confequently, there will remain three Pounds to be difcharged by Urine and Stool, thirty-two Ounces by Urine, and four Ounces by Stool. *Aph.* 59, 60. *Sect.* 1. Thefe Quantities of Perfpiration and Urine, muft be the Quantities difcharged

D

in

in a natural Day in Summer, by *Aph.* 21.
Sect. 1. And from thefe we may get the
Quantities of Perfpiration and Urine in a
natural Day in Winter, by *Aph.* 41. *Sect.*
2. which Quantities will be 48 and 44.
Hence in *Italy* Perfpiration is to Urine in
a natural Day in Summer as 1.870 is to
1, or as 1870 is to 1000 ; and in a natu-
ral Day in Winter Perfpiration is to Urine
as 1.090 is to 1, or as 1090 is to 1000.
The Sums of the Proportions of Perfpira-
tion to Urine in Summer and Winter, di-
vided by 2, will nearly give their Pro-
portion in Spring and Autumn ; which
therefore will be as 1.480 is to 1, or as
1480 is to 1000.

STATICAL

STATICAL TABLES.

TABLE I.

Dr. Robinson, Aged 42, A.D. 1721.

Months	Food				Morning.		Afternoon.		Night.		Who.e Urine.	Whole Perfp.	Stool	Whole Difch.	$\frac{p}{u}$
	Break	Dinn.	Supp.	Whole	Urine	Perfp.	Urine	Perfp.	Urine	Perfp.					
April	23.37	44.00	16.22	83.59	8.38	11.00	17.40	11.26	16.59	16.05	42.37	38.31	5.27	85.95	0.904
May	23.30	47.35	21.62	92.27	7.18	13.12	17.77	11.62	16.75	19.52	41.70	44.26	7.42	93.38	1.061
June	27.20	48.13	15.10	90.43	7.13	15.68	12.10	12.70	14.53	22.77	33.76	51.15	5.32	90.23	1.515
July	25.98	41.12	15.53	82.63	7.78	14.83	10.30	12.28	12.30	19.32	30.38	46.43	5.85	82.66	1.528
Auguft	22.04	43.10	20.54	85.68	7.35	17.42	10.00	13.15	12.58	20.69	29.93	51.27	4.48	85.68	1.713
Septem.	18.72	48.00	19.74	86.46	7.50	13.48	13.12	11.02	15.50	19.93	36.12	44.43	5.15	85.70	1.230
October	18.85	45.88	15.68	80.42	7.20	9.98	13.72	10.10	16.68	17.52	37.60	37.60	5.05	80.25	1.000
Novem.	22.38	40.92	15.06	78.37	7.65	8.94	12.75	8.69	16.69	18.02	37.09	35.65	4.71	77.45	0.961
Mean	22.73	44.81	17.44	84.98	7.52	13.06	13.39	11.35	15.20	19.22	36.12	43.64	5.41	85.16	1.208
Summer	25.49	45.53	17.42	88.44	7.36	14.54	13.39	12.20	14.53	20.54	35.28	47.28	6.20	88.76	1.340
Autumn	19.87	45.66	18.65	84.18	7.35	13.63	12.28	11.42	14.92	19.38	34.55	44.43	4.89	83.87	1.286
Mean	22.68	45.59	18.03	86.31	7.35	14.08	12.83	11.81	14.72	19.97	34.91	45.86	5.54	86.31	1.315

TABLE 2.

Dr. Robinson, Aged 64-5, A.D. 1744-5.

Months.	Food. Meat	Drink	Whole	±d	Urine Day.	Spec. Grav.	Urine Night	Spec. Grav.	Urine whole	Perspiration. Day.	Night	Whole	Stool	Whole Difch.	p/u	Pulse in 1'.
Novem.	18.77	41.73	60.50	+14	17.96	10252	12.22	10273	30.18	20.32	8.03	28.35	2.45	60.98	0.939	63
Decem.	20.05	41.98	62.03	−11	18.90	10260	11.76	10277	30.66	19.46	8.49	27.95	3.06	61.67	0.911	63
January	19.70	43.34	63.04	+66	17.75	10251	13.43	10255	31.18	18.07	9.22	27.29	6.67	65.14	0.875	66
Febr.	18.59	43.10	61.68	−4	14.91	10260	13.03	10266	27.94	17.07	9.55	26.62	7.01	61.57	0.953	65
March	20.80	39.90	60.70	+18	16.83	10250	12.13	10269	28.96	19.18	9.44	28.62	3.70	61.28	0.988	63
April	19.93	40.10	60.03	+7	17.00	10252	10.89	10275	27.89	21.86	7.86	29.73	2.64	60.26	1.066	62
May	19.39	36.93	56.32	+8	19.12	10256	9.05	10291	28.17	19.18	6.71	25.89	2.52	56.58	0.919	65
June	22.10	34.23	56.33	−13	16.20	10234	9.07	10256	25.27	19.51	8.12	27.63	3.00	55.90	1.093	66
July	22.50	33.79	56.29	−5	17.42	10247	10.37	10271	27.79	17.45	7.63	25.08	3.25	56.12	0.902	63.4
August	22.04	34.38	56.42	+5	15.70	10234	10.25	10264	25.95	20.27	7.98	28.25	2.38	56.58	1.088	63.8
Septem.	20.53	35.06	55.60	+42	15.61	10236	10.13	10279	25.75	19.80	8.75	28.55	2.69	56.99	1.108	63.6
October	19.63	34.32	53.95	−6	15.77	10235	10.42	10272	26.19	18.34	7.16	25.50	2.08	53.77	0.973	60.4
Mean	20.33	38.24	58.57	+121	16.93	10247	11.06	10270	27.99	19.21	8.24	27.45	3.45	58.89	0.980	63.6
Winter	19.51	42.35	61.86	+69	18.20	10254	12.47	10268	30.67	19.28	8.58	27.86	4.06	62.60	0.908	64
Spring	19.77	41.03	60.80	+21	16.25	10254	12.02	10270	28.27	19.37	8.95	28.32	4.45	61.04	1.002	63
Summer	21.33	34.98	56.31	−10	17.58	10246	9.50	10273	27.08	18.71	7.49	26.20	2.92	56.20	0.967	64.8
Autumn	20.73	34.59	55.32	+41	15.69	10235	10.26	10272	25.96	19.47	7.96	27.43	2.38	55.77	1.057	62.6
Mean	20.33	38.24	58.57	+121	16.93	10247	11.06	10270	27.99	19.21	8.24	27.45	3.45	58.89	0.980	63.6

TABLE 3.

Months.	A. D. 1721.					A. D. 1744-5.				
	Food.	$\frac{u}{T}$ Day.	$\frac{u}{T}$ Night.	$\frac{p}{T}$ Day.	$\frac{p}{T}$ Night.	Food.	$\frac{u}{T}$ Day.	$\frac{u}{T}$ Night.	$\frac{p}{T}$ Day.	$\frac{p}{T}$ Night.
November	78.37	1.700	1.391	1.470	1.502	60.50	1.197	1.358	1.355	0.892
December						62.03	1.260	1.307	1.297	0.943
January						63.04	1.183	1.492	1.205	1.024
February						61.68	0.994	1.448	1.138	1.061
March						60.70	1.122	1.348	1.279	1.049
April	83.59	2.148	1.382	1.855	1.338	60.03	1.133	1.210	1.457	0.873
May	92.27	2.079	1.396	2.062	1.627	56.32	1.274	1.006	1.279	0.745
June	90.43	1.602	1.211	2.365	1.897	56.33	1.117	0.955	1.345	0.855
July	82.63	1.507	1.025	2.260	1.610	56.29	1.201	1.091	1.203	0.803
August	85.68	1.446	1.048	2.547	1.724	56.42	1.083	1.079	1.398	0.840
September	86.46	1.718	1.291	2.042	1.661	55.60	1.076	1.066	1.365	0.921
October	80.42	1.743	1.390	1.673	1.460	53.95	1.088	1.097	1.265	0.753
Mean	84.98	1.742	1.267	2.034	1.602	58.57	1.144	1.202	1.298	0.896
Winter						61.86	1.213	1.385	1.285	0.953
Spring						60.80	1.083	1.335	1.291	0.994
Summer	88.44	1.729	1.211	2.229	1.71	56.31	1.197	1.018	1.273	0.805
Autumn	84.19	1.635	1.243	2.088	1.61	55.32	1.082	1.080	1.343	0.838
Mean	86.31	1.682	1.227	2.158	1.664	58.57	1.144	1.202	1.298	0.896

D 3

TABLE 4.

Hours.	B Persp.	B Urine	D Persp.	D Urine
6	1.875	0.937	2.000	1.000
7	1.833	1.000	1.400	1.000
8	2.000	1.000	1.500	1.200
9	2.000	1.166	1.800	1.300
10	2.000	1.500	1.900	1.000
11	1.750	1.000	1.400	1.000
12	2.333	1.000	1.800	1.000
1	2.333	1.250	1.500	1.000
2	2.000	1.000	1.500	1.000
3	3.500	1.500	2.000	1.000
4	2.333	2.000	1.500	1.143
5	2.333	2.000	1.800	1.000
6	2.666	2.000	2.000	1.000
7	2.000	2.000	2.000	1.000
8	2.333	2.333	2.000	1.000
9	2.333	1.666	1.500	1.500
10	2.333	1.666	1.500	1.500

TABLE 5.

Men	F	Morning p	u	p/u	Afternoon p	u	p/u	Night p	u	p/u	Whole p	u	p/u
B	86	16.249	8.916	1.822	19.831	15.165	1.307	15.000	7.496	2.001	51.080	31.577	1.618
D	63	12.800	8.500	1.506	14.360	9.143	1.564	16.000	8.000	2.000	43.100	25.643	1.681

TABLE 6.

Months	Day.	Food	±d	Difch	Urine	Perfp.	Stool.	$\frac{p}{u}$
Nov.	18	61.0	+29	90.0	49.00	38.00	3.00	0.775
Dec.	13	62.0	+11	73.0	41.00	28.05	3.05	0.695
	14	67.0	+ 6	73.0	41.00	29.00	3.00	0.707
	28	54.0	+17	71.0	34.00	34.00	3.00	1.000
Janu.	2	62.0	+37	99.0	31.25	40.75	27.00	1.304
	25	40.5	+26	66.5	34.05	28.00	4.00	0.811
	30	82.0	+ 7	89.0	31.75	24.05	32.75	0.771
	31	61.5	+32	93.5	28.05	30.00	35.00	1.052
Febr.	1	64.5	+24	88.5	18.00	23.25	47.25	1.291
	16	58.0	+ 7	65.0	23.05	28.75	2.75	0.831
	17	81.0	+ 0	81.0	31.75	28.25	21.00	0.890
March	17	66.0	—15	51.0	26.50	22.00	2.05	0.830
	30	20.0	+28	48.0	21.50	26.25	0.00	1.232
April	24	59.0	+15	74.0	31.05	40.25	2.25	1.262
	25	64.0	—14	50.0	21.05	28.05	0.00	1.325
May	20	23.0	+26	49.0	27.05	20.25	1.25	0.736
	25	23.0	+36	59.0	33.00	23.25	2.75	0 705
June	3	60.0	+12	72.0	27.00	41.75	3.25	1.546
	13	47.0	+21	68.0	24.05	31.50	12.00	1.286
	30	54.0	—17	37.0	22.75	11.05	2.75	0.505
July	12	13.0	+28	41.0	22.00	17.05	1.50	0.795
	28	24.0	+30	54.0	24.05	27.25	2.25	1.112
Auguft	6	77.0	—25	52.0	21.25	24.25	6.50	1.139
	8	34.0	+25	59.0	20.05	31.05	7.00	1.536
Sept.	7	70.0	—20	50.0	22.00	28.00	0.00	1.272
	8	27.0	+26	53.0	24.05	26.00	2.50	1.061
Octob.	30	69.0	—21	48.0	22.25	21.05	4.50	0.955

TABLE 7.
Dr. KEILL, Aged 39, A. D. 1717-18.

Months.	Weight lb.	Food. oz	Urine Day. oz.	Urine Night. oz.	Perspiration Day. oz.	Perspiration Night. oz.	Total Urine oz.	Total Perfp oz.	p/u
July	154.09	74.62	18.54	17.98	18.98	15.95	36.52	34.93	0.957
Auguft	153.75	78.00	17.27	13.76	18.31	13.12	31.03	31.43	1.013
September	154.60	76.00	16.00	18.00	18.73	13.25	34.00	31.98	0.941
October	155.99	68.87	21.86	15.55	16.26	11.40	37.41	27.66	0.739
November	155.85	64.61	22.02	17.17	18.18	10.50	39.19	28.68	0.732
December	154.84	63.17	18.97	14.42	16.18	11.21	33.39	27.38	0.820
January	153.77	63.12	23.68	14.51	17.72	11.53	38.19	29.25	0.766
February	154.80	83.25	20.66	16.34	20.14	10.20	37.00	30.34	0.820
March	155.93	94.33	28.58	19.07	16.18	10.70	47.65	26.88	0.564
April	155.38	67.25	25.04	19.99	18.52	11.41	45.03	29.93	0.664
May	155.96	84.67	16.58	21.10	22.46	13.37	37.68	35.83	0.951
June	158.76	84.64	19.31	18.41	24.00	13.38	37.72	37.38	0.991
Mean	155.31	75.21	20.71	17.19	18.80	12.17	37.90	30.97	0.817
Summer	156.27	81.31	18.14	19.16	21.81	14.23	37.30	36.04	0.966
Autumn	154.78	74.29	18.38	15.77	17.77	12.59	34.15	30.36	0.889
Winter	154.82	63.63	21.55	15.37	17.36	11.08	36.92	28.44	0.770
Spring	155.37	81.61	24.76	18.47	18.28	10.77	43.23	29.05	0.672
Mean	155.31	75.21	20.71	17.19	18.80	12.17	37.90	30.97	0.817

TABLE 8.

Mr. Rye, Aged 42, A.D. 1721-2.

Months.	Weight.	Food.	Urine Day.	Urine Night.	Total Urine	Total Persp.	p/u
	lb.	oz.	oz.	oz.	oz.	oz.	
May	196.56	102.41	21.96	18.76	40.72	61.10	1.500
June	197.12	97.91	20.60	16.00	36.60	60.23	1.645
July	197.62	94.23	19.60	15.73	35.33	58.83	1.665
Auguſt	197.75	99.66	18.15	15.25	33.40	66.60	1.994
September	196.50	96.54	19.54	15.73	35.27	57.77	1.638
Oċtober	195.81	90.12	21.68	17.19	38.87	49.56	1.275
November	197.69	87.93	21.87	17.77	39.64	47.37	1.195
December	199.44	89.12	21.64	19.48	41.12	53.72	1.306
January	197.25	94.73	20.73	18.80	39.53	50.13	1.268
February	200.81	94.98	22.48	17.95	40.43	55.14	1.364
March	200.47	100.53	20.93	19.07	40.00	56.87	1.422
April	196.53	108.57	22.86	17.96	40.82	62.61	1.534
Mean	197.80	96.39	21.00	17.47	38.47	56.66	1.472
Summer	197.10	98.18	20.72	16.83	37.55	60.05	1.600
Autumn	196.69	95.44	19.79	16.06	35.85	57.98	1.617
Winter	198.13	90.59	21.41	18.68	40.09	50.41	1.257
Spring	199.27	101.36	22.09	18.33	40.42	58.21	1.440
Mean	197.80	96.39	21.00	17.47	38.47	36.56	1.472

TABLE 9.

Dr. LINING, A.D. 1739-40.

Months.	Food. Meat	Drink	Whole	±d	Discharges. Urine	Persp.	Stool	Whole	$\frac{du}{nu}$	$\frac{dp}{np}$	$\frac{dp}{du}$	$\frac{np}{nu}$	$\frac{p}{u}$	Ba-rom.	Heat by N's Scal	Moist of Air	Rain.
March	27.75	101.03	128.78	— 3.6	77.26	47.48	3.92	128.66	1.215	1.105	0.596	0.655	0.614	30.00	4.69	12	1.141
April	26.51	93.11	119.62	+ 39.6	64.55	52.74	3.65	120.94	1.329	1.275	0.794	0.830	0.817	30.03	6.56	7	1.092
May	28.94	100.43	129.37	+ 12.3	61.69	64.35	3.74	129.78	0.842	1.545	1.252	0.683	1.043	30.10	7.87	9	5.612
June	24.84	112.89	137.73	+ 69.0	57.55	78.33	4.15	140.03	0.789	1.631	1.705	0.825	1.361	30.09	8.81	10	4.648
July	26.80	120.34	147.14	+ 10.8	47.82	95.36	4.32	147.50	0.623	2.151	2.964	0.879	1.994	30.10	9.19	11	3.013
Auguſt	27.65	115.44	143.09	+ 4.8	60.79	77.80	4.65	143.25	0.725	2.115	1.717	0.592	1.280	29.60	8.44	12	7.301
Septem.	25.70	104.00	129.70	+ 111.9	43.95	84.58	4.90	133.43	0.862	2.039	2.142	0.906	1.924	30.11	8.06	12	3.200
October	26.31	80.00	106.31	— 72.9	52.34	44.76	6.78	103.88	0.722	1.049	1.003	0.700	0.855	30.22	4.50	12	1.257
Novem.	29.33	90.94	120.27	— 91.8	68.84	44.36	4.00	117.21	1.215	1.072	0.630	0.714	0.644	30.24	3.75	14	1.848
Decem.	29.50	100.44	129.94	— 48.0	77.55	46.69	4.10	128.34	1.310	1.468	0.632	0.563	0.602	30.11	1.87	10	2.736
January	25.94	104.35	130.29	— 58.0	80.18	43.68	4.50	128.36	1.618	1.369	0.532	0.859	0.545	30.09	2.45	18	4.492
Febr.	26.91	103.06	129.97	+ 6.6	85.59	41.08	3.53	130.19	1.723	1.379	0.449	0.568	0.480	30.25	2.62	16	3.135
Mean	27.18	102.17	129.35	— 19.3	64.84	60.10	4.35	129.30	1.081	1.516	1.201	0.731	0.927	30.08	5.73	11.9	3.289
Spring	27.05	99.06	126.11	+ 42.6	75.80	47.10	3.70	126.60	1.422	1.253	0.613	0.684	0.621	30.09	4.62	11.66	1.789
Summer	26.86	111.22	138.08	+ 92.1	55.69	79.35	4.07	139.11	0.751	1.776	1.974	0.796	1.425	30.10	8.62	10.00	4.424
Autumn	26.55	99.81	126.36	— 43.8	52.36	69.05	5.44	126.85	0.770	1.737	1.621	0.733	1.318	29.97	7.00	12.00	3.919
Winter	28.26	98.58	126.84	— 197.8	75.52	44.91	4.20	124.63	1.381	1.303	0.598	0.712	0.595	30.15	2.69	14.00	3.025
Mean	27.18	102.17	129.35	— 19.3	64.84	60.10	4.35	129.29	1.081	1.517	1.201	0.731	0.927	30.08	5.73	11.91	3.289

TABLE 10.

Seasons.	Italy.		England.		Cork.		Ireland. Dublin, 1721		Dublin, 1744		South Carolina.	
	Food.	$\frac{p}{u}$	Food.	$\frac{p}{u}$	Food.	$\frac{p}{u}$	Food.	$\frac{p}{u}$	Food.	$\frac{p}{u}$	Food.	$\frac{p}{u}$
Spring	101.08	1.480	81.61	0.672	101.36	1.440			60.80	1.002	126.11	0.621
Summer	101.08	1.870	81.31	0.966	98.18	1.600	88.44	1.340	56.31	0.967	138.08	1.425
Autumn	101.08	1.480	74.29	0.889	95.44	1.617	84.18	1.286	55.32	1.057	126.36	1.318
Winter	101.08	1.090	63.63	0.770	90.59	1.257			61.86	0.908	126.84	0.595
Mean	101.08	1.480	75.21	0.817	96.39	1.472	86.31	1.141	58.57	0.980	129.35	0.927

Observations on the foregoing Tables.

O *BS.* 1. By Table 1, the Heat and Cold of the Air affect Perspiration and Urine in a different manner ; Heat increases Perspiration and lessens Urine, and Cold on the contrary lessens Perspiration, and increases Urine. In *April* and *May* these two Discharges were nearly equal, only Urine exceeded Perspiration a little in *April*, and was exceeded by it a little in *May*. In the three Months *June*, *July*, and *August*, Perspiration exceeded Urine in the Proportion of above 1.5 to 1, or 15 to 10. Perspiration was greatest, and Urine least, in *August*. In *September* Perspiration lessened, and Urine increased. And in *October* and *November* they were nearly equal again, only Urine exceeded Perspiration a little in *November*. At the End of this Month I was interrupted, and hindered from carrying on the Experiments to the End of the Year, as I at first intended ; but I repeated them for about ten Days in cold frosty Weather, and found

3

found that Urine then exceeded Perspiration as much as Perspiration exceeded Urine in Summer. Hence, supposing the Quantity of Food, and the Proportion of the Drink to the Meat, to have been the same in Winter as in Summer; the Proportion of Perspiration to Urine in Summer would have been greater than the Proportion of Perspiration to Urine in Winter, nearly in the Proportion of 18 to 10.

Obf. 2. By comparing the Food and the Discharges of the whole eight Months of Table 1, it appears that they were very nearly equal in a natural Day, taking one Day of that whole Time with another. For taking one Day with another, the daily Discharges exceeded the daily Food by only the 0.18th part of an Ounce, which is not a Quarter of an Ounce Averdupois. This daily Loss of Weight, though small, yet in the whole eight Months, or 244 Days, amounted to 43.92 Ounces; that is, to near two Pounds and a half. It is natural for Bodies to

fall

fall away in Summer. *Sanctorius* fays, that temperate Bodies are lighter in Summer than in Winter by about three Pounds, that is, by near thirty-eight Averdupois Ounces. A Change in the Weight of a Body at different Seafons of the Year, arifes from an Inequality between the Quantity of Food and fome of the Difcharges in thofe Seafons. When a Body gains in Weight, the Food exceeds the Difcharges; and when it lofes in Weight, the Difcharges exceed the Food. If therefore from a given Quantity of Food a Body be lighter in Summer than in Winter, the Difcharges exceed the Food in Summer, and fall fhort of the Food in Winter. Confequently, in Summer Perfpiration is more increafed than Urine is leffened, and Perfpiration more leffened than Urine is increafed in Winter; whereas to keep a Body always of the fame Weight, the Increafe or Decreafe of Perfpiration muft be ever equal to the Decreafe or Increafe of Urine, fuppofing the Quantity of Stool to be always the fame. Hence, the Heat and Cold of the Air

firft

firft affect the Surface of the Body, and increafe or leffen Perfpiration; and afterwards, in fome little Time, the Increafe or Diminution of Perfpiration is attended with an equal Diminution or Increafe of Urine. Whence, the Body from a given Quantity of Food neceffarily becomes lighter in Summer than in Winter, when the Air is hot than when it is cold; fuppofing the Quantity of Stool, which is a very fmall Difcharge when compared with Perfpiration and Urine, to be much the fame in Summer and in Winter, as it is found to be in regular and temperate Bodies. This Property of Perfpiration and Urine is caufed by a Difference in the Motion of the Blood, at the Surface of the Body, and in its inward Parts, at the Skin and in the Kidneys, in thefe two different Seafons of the Year. The Heat of the Air acting on the Surface of the Body, fwells the Veffels of the Skin, Bloodveffels, and fecerning Ducts, and increafes the Motion of their refpective Fluids through them; but when the Motion of the animal Fluids, Blood, and fecerned

<div align="right">Humours,</div>

Humours, is increafed in one Part, it is leffened in the other Parts in healthful Bodies, when it is increafed in the Skin, it is leffened in the Kidneys, by *Prop.* 19. *Anim. Oecon.* and therefore when Perfpiration is increafed or leffened by the Heat or Cold of the Air, Urine is leffened or increafed equally, but not at the very fame Time the Change is made in Perfpiration ; for all Changes of Motion in the animal Fluids are gradual ; and confequently, when the Motion of the Blood is increafed at the Skin, it will require fome Time to be equally leffened in the Kidneys. Hence, from the Nature of the Blood's Motion, the Weight of a healthful Body is lefs in Summer than in Winter. But though the Weight of the Body, and the Proportion of Perfpiration to Urine, be both changed by the Heat and Cold of the Air, yet will thefe Changes be very inconfiderable in a grown Body which ufes but little Exercife, provided the Body be fupported with a proper Quantity of good Food, and the Proportion of the Meat to the Drink be not lefs

than

than that of 1 to 2. The Quantity of
Food proper to preſerve the Weight and
Health of a grown Body, which uſes but
little Exerciſe, much the ſame at all Sea-
ſons of the Year, may be had from Table
1. p. 10.

Obſ. 3. Perſpiration and Urine are leſs
affected by the Heat and Cold of the Air,
and approach nearer to a Proportion of
Equality in Summer and Winter, when
the Quantity of the Food is leſs, and the
Proportion of the Meat to the Drink
greater, than when the Quantity of the
Food is greater, and that Proportion is
leſs. This appears from the Tables 1 and
2. In the Summer 1721, the daily Quan-
tity of my Food at a Medium was 88.44
Ounces, and I judge the Proportion of
my Meat to my Drink to have been about
$\frac{3}{8}$, my Meat being about 24 Ounces in a
Day, and my Drink 64.44. And in the
Summer 1745, the daily Quantity of my
Food at a Medium was 56.31 Ounces,
and the Proportion of my Meat to my
Drink was nearly $\frac{3}{5}$, my Meat being 21.33

Ounces

Ounces in a Day, and my Drink 34.98.
In the Summer 1721 Perfpiration was
greater than Urine, in the Proportion of
1340 to 1000; and in the Summer 1745
it was almoft equal to Urine, only lefs in
the Proportion of 967 to 1000. And
therefore Perfpiration and Urine approach
nearer to a Proportion of Equality in Sum-
mer and Winter, under a leffer Quantity
of Food, and a greater Proportion of the
Meat to the Drink, than they do under a
greater Quantity of Food, and a lefs Pro-
portion of the Meat to the Drink.

Hence we may conclude, that *Cornaro's*
Perfpiration and Urine were equal at all
Seafons of the Year; for he did not take
above half my Quantity of Food, and his
Meat to his Drink was almoft double of
my Meat to my Drink, his being $\frac{5}{7}$, and
mine about $\frac{1}{2}$; for $\frac{6}{7}$ is to $\frac{1}{2}$, as 12 to 7.
By this fmall Quantity of Food, and great
Proportion of his Meat to his Drink, this
noble *Venetian* at the Age of forty, freed
himfelf, by the Advice of his Phyficians,
from feveral grievous Diforders contracted
by

by Intemperance, and lived in Health of
Body and great Chearfulnefs of Mind to
above an Hundred. And I at the Age of
fixty-four, by leffening my Food, and in-
creafing the Proportion of my Meat to my
Drink, by leffening my Drink about a
third Part, and my Meat about a fixth, of
what they were in the Year 1721, have
freed myfelf from the Returns of fome
flight Diforders, and have greatly for my
Age recovered the paralytick Weaknefs I
was feized with about three Years ago.
Hence we gather, that good and conftant
Health confifts in a juft Quantity of Food,
and a juft Proportion of the Meat to the
Drink ; and that to be freed from chroni-
cal Diforders contracted by Intemperance,
the Quantity of Food ought to be leffen-
ed, and the Proportion of the Meat to the
Drink increafed more or lefs according to
the Greatnefs of the Diforders ; and that
both the Quantity of Food, and the Pro-
portion of the Meat to the Drink ought
to be fuch as fhall make Perfpiration and
Urine nearly equal at all Seafons of the
Year. For Changes of the Seafons, as to

Heat

Heat and Cold, are the moft common Caufes of Difeafes; *Hipp. Aph.* 1. *Sect.* 3.

Before I proceed farther in the Obfervations, it is proper to give an Account of the Quality of my Food, and of the State of my Blood under this Reduction of my Food.

During the Year of Experiments from which I compofed Table 2, I commonly eat four Ounces of Bread and Butter, and drank half a Pound of a very weak Infufion of Green Tea for Breakfaft. For Dinner I took two Ounces of Bread, and the reft Flefh-meat, Beef, Mutton, Pork, Veal, Hare, Rabbet, Goofe, Turkey, Fowl tame and wild, and Fifh; and I generally chofe the ftrongeft Meats, as fitteft, fince they agreed well with my Stomach, to keep up the Powers of my Body under this great Diminution of my Food; I feldom took any Garden Stuff with my Meat, finding that it commonly leffened Perfpiration, and increafed my Weight. I drank four Ounces of Water with my Meat, and a Pound of Claret after I had
done

done eating. And at Night I eat nothing but drank twelve Ounces of Water, with a Pipe of Tobacco. This was my Courfe of Diet during that Year. Ever fince that Time, I have leffened my Food a little; for in the following Year it was only 53 Ounces in a Day at a Medium; and this Year, as far as it is gone, which is feven Months, it is much about the fame Quantity. This Diminution of my Food fince the firft Year, confifted chiefly in leffening the Quantity of Water.

To know the State of my Blood under this Reduction of my Food, I had 1855 Grains of Blood drawn from my Arm the 28th of *May* 1747; which, after ftanding twenty-four Hours, gave 1205 Grains of *Craffamentum* or red part, and 650 Grains of *Serum.* Let R denote the Weight of the red part, and S the Weight of the *Serum*, and then $\frac{R}{S}$ will be $\frac{1205}{650}$ $= 1.854.$ And the fpecifick Gravity of the *Serum* was 10364, the fpecifick Gravity of Water being 10000. The mean

Propor-

Proportion of the red part of the Blood to the *Serum*, that is $\frac{R}{S}$, and the fpecifick Gravity of the *Serum*, are, in the ordinary way of living, 1.400, and 10300 in healthful Men.

Notwithftanding this great Proportion of the red part of my Blood to the *Serum*; it flowed out of the Orifice in a full Stream, and with great Force; which argues that it was very fluid whilft it circulated in the Body. And that this greater than ordinary Proportion of the red part of my Blood to the *Serum*, has been of ufe to me now I ufe little Exercife, appears from my having been free two Years from a *fore Throat* and a *Diarrhœa*, Diforders I often had, though they were but flight and never confined me, when I lived more fully and ufed more Exercife; and it farther appears from my having had no Return of my convulfive and paralytick Diforder.

Now, as the Proportion of the red part of my Blood to the *Serum*, has increafed

on

on increasing the Proportion of my Meat
to my Drink, the Proportion of the red
part of the *Serum* may in some sort be
measured by the Proportion of the Meat
to the Drink, that is, putting M for the
Meat, and D for the Drink, $\frac{R}{S}$ may in
some sort be measured by $\frac{M}{D}$. Hence, if
the red part of the Blood bears too great
a Proportion to the *Serum*, which is the
Case of athletick Persons, and others who
do not take a sufficient Quantity of Drink
with their Meat, that Fault may be cor-
rected, by lessening the Meat or by in-
creasing the Drink. A young Man, who
for a considerable Time had not drank
with his Meat, and had a very florid Com-
plexion and a scorbutick Eruption all over
his Body, Arguments of too great a Pro-
portion of the red part of the Blood to
the *Serum*, was freed from the Eruption
by drinking with his Meat, without any
other Remedy. In the beginning of Fe-
vers, the Proportion of the red part of
the Blood to the *Serum* is greater, and at

E 4 the

the end of them leffer, than it is in
Health ; and the Change of this Propor-
tion in Perfons under thefe Diforders,
is owing to their living wholly upon
Drink and liquid Nourifhment. And
Bodies loaded with ferous Moifture, an
Argument of too fmall a Proportion of
the red part of the Blood to the *Serum*,
have been freed from their Load, by ab-
ftaining wholly from Drink.

But though the Proportion of the red
part of the Blood to the *Serum*, varies
with the Proportion of the Meat to the
Drink, yet there are other Things, be-
fides the bare Quantities of Meat and
Drink, which have a Share in fettling the
Proportion of the red part of the Blood
to the *Serum*. For this Proportion is
greater in Country People than Citizens,
in Perfons who ufe-Exercife than in Per-
fons who are inactive, and in Perfons who
live upon Flefh-meats and fermented Li-
quors, than in Perfons who live upon Ve-
getables and Water. In fhort, this Pro-
portion is increafed by Things which dry
the

the Body and ſtrengthen the Fibres, and leſſened by Things of a contrary Nature.

Too great a Proportion of the red part of the Blood to the *Serum*, renders Bodies ſubject to inflammatory Fevers on taking Cold. For when Blood is drawn, and ſuffered to ſtand in the Air till it is cold, its red parts coaleſce and form a *Coagulum*, leaving the *Serum* almoſt as fluid as Water. This ſhews that the red Corpuſcles of the Blood attract one another more ſtrongly, than they do the tranſparent Corpuſcles of the *Serum* ; and conſequently, when the Blood happens to be greatly ſtock'd with red Corpuſcles, and they are brought ſtill nearer together by Cold, their attractive Forces may make them run together, coaleſce, and obſtruct the capillary Blood-veſſels, in which I have ſhewn the Motion of the Blood to be exceeding ſlow. And this they will be the moſt apt to do in the Blood-veſſels of thoſe Parts which are moſt expoſed to the Cold of the Air, as the Blood-veſſels of the Throat, Lungs, and

and *Pleura* are; whence arife Inflamma-
tions of thofe Parts.

Obf. 4. The Quantity and Quality of
the Food, and the Proportion of the
Meat to the Drink, being given, the
Weight of a Body is lefs, and confequent-
ly its Difcharges greater in dry Weather
than in wet Weather. In the firft fifteen
Days of *May*, when the Air was dry, the
daily Quantities in Ounces of my Perfpi-
ration and Urine, at a Medium, were
29.66 and 28.50; and in the nine follow-
ing Days, when the Air was moift, the
mean Quantities of Perfpiration and Urine
in a Day were 20.39 and 28.94 Ounces.
I took above four Ounces of Food more
in a Day the firft fifteen Days, than I did
the nine Days, and yet I gained two
Pounds under the leffer Quantity of Food,
and fhould have gained twice as much,
had I not one Day leffened my Food above
forty Ounces. Hence Perfpiration was
9.27 Ounces in a Day lefs, and Urine
only the 0.44 part of an Ounce greater, in

the nine wet Days, than in the fifteen dry
Days; and confequently my Perfpiration
was above twenty times more leffened
than my Urine was increafed, by this
Change of Weather from dry to wet.
Hence Bodies, which live much in the
fame manner, as to the Quantity and Qua-
lity of their Food, and the Proportion of
their Meat to their Drink, are lighter in
dry Weather than in wet Weather, which
may be thus accounted for. The Moi-
fture of the Air moiftens the Fibres of
the Skin, and leffens Perfpiration by lef-
fening their vibrating Motion. For the
moifter the Fibres of the Skin are, the
greater is their Denfity; and the greater
their Denfity is, the lefs is the Denfity of
the Æther lodged within them; and the
lefs the Denfity of the Æther is, the
weaker is its vibrating Motion; and the
weaker the vibrating Motion of the Æther
is, the weaker is the vibrating Motion of
the Fibres caufed by it. The vibrating
Motion of the Air, Æther, and all ela-
ftick Fluids, is made lefs and flower by
Water and watry Moifture. Hence mu-
fical

fical Sounds which are caufed by a vibra-
ting Motion in the Air, are lower and
graver in a moift Atmofphere than in a
dry one.   The Sound of a mufical Cat-
gut String is made weaker and graver by
wetting the String.   And the Cafe is the
fame in the Nerves and Fibres of the Skin,
watry Moifture apply'd to them leffens
their vibrating Motions, and of confe-
quence leffens Perfpiration depending on
thofe Motions.   And when Perfpiration
is thus leffened by the Moifture of the
Air, Urine by degrees is increafed, but
not equally, as appears by the above In-
ftance ; whence a Body from a given
Quantity of Food, and a given Proportion
of the Meat to the Drink, is neceffarily
heavier in wet Weather than in dry Wea-
ther.

Hence we learn, that to keep a Body
of the fame Weight in wet Weather as in
dry, either the Quantity of Food muft be
leffened, or the Proportion of the Meat
to the Drink increafed ; and both thefe
will

will be done by leſſening the Drink, without making any Change in the Meat.

By comparing this Obſervation with the two firſt Obſervations, it appears, that the Heat and Dryneſs of the Air change the Weight of the Body in like manner, for they both leſſen it ; and that the Cold and Moiſtneſs of the Air likewiſe change the Weight in the ſame manner, for they both increaſe it.

Obſ. 5. By the firſt part of Table 3, when I lived more fully and uſed more Exerciſe, both Perſpiration and Urine drawn off hourly from the Blood during the whole eight Months, were at a Medium greater in the Day than in the Night ; Urine was greater almoſt in the Proportion of 3 to 2, and Perſpiration greater in the Proportion of 5 to 4. And by the ſecond part of the Table, when the Quantity of my Food was conſiderably leſs, and the Proportion of my Meat to my Drink greater, the Quantity of Urine drawn off from the Blood hourly

at

at a Medium throughout the whole Year,
was nearly the fame in the Day and in the
Night, in the Time of my being up and
Time of my being in Bed, only it was
fomething greater in the Night than in
the Day ; and the hourly Perfpiration was
remarkably greater in the Day than in the
Night, in the Proportion of 1298 to 896.
The Caufe of the remarkable Inequality
between the Quantities of Urine drawn
off hourly from the Blood in the Day
and in the Night in the firft part of the
Table, was too great a Quantity of Drink
taken at Dinner.   For when above a cer-
tain Quantity of Drink is taken with the
Meat at Dinner, it is apt to run off quick
by Urine, and fo to make the Day's Urine
exceed the Night's Urine more than if
lefs Drink had been taken.

Now as Bodies are apt to be difordered by
fuch a Quantity of fermented Liquors as
paffes off quick in pale Urine, it is rational
to think that the Quantity of Drink ought
not to exceed fuch a Quantity as can be
drawn off from the Blood at much the

<div align="right">fame</div>

fame rate in the Day and in the Night;
which Quantity may be known by *Table*
1. p. 10. fuppofing the Drink to the Meat
to be as 2 to 1, and the Body to be grown,
and to ufe but little Exercife; for the
Quantities of Food fet down in that
Table, and the Proportion of the Drink
to the Meat, may not be fufficient for
growing Bodies, and Bodies which ufe
much Exercife. And the Caufe of the
remarkable Inequality between the hour-
ly Perfpiration in the Day and in the
Night, was a Difference in the Heat and
Motion of the Blood in thofe two times.
For the Heat and Motion of the Blood
are always greater, from a greater Activi-
ty in the Soul, in the Day, than in the
Night; and they are likewife ever greater
from the Food taken in the Day-time;
for the Pulfe is always quicker after eating
than before it, after a full Meal than after
a fpare one, and after a Meal of drier and
ftronger Food than after a Meal of Food
that is moifter and weaker. My Food
was remarkably dry and of a ftrong Na-
ture in the fecond Table, when com-
pared with what it was in the firft. And
there-

therefore the remarkable Inequality- be-
tween the mean hourly Perfpiration in the
Day and Night might be caufed by a Dif-
ference in the Motion of the Blood in
thofe Times.

Obf. 6. The mean hourly Perfpiration
in the Day exceeds the mean hourly Per-
fpiration in the Night, in both parts of
Table 3. And the Proportion of the
mean hourly Perfpiration in the Day to the
mean hourly Perfpiration in the Night, is
greater in the fecond part of that Table
than in the firft, when the Food was lefs
in Quantity and drier, than when it was
more in Quantity and moifter. In Sum-
mer and Autumn, the mean hourly Per-
fpiration in the Day in Proportion to the
mean hourly Perfpiration in the Night,
was 1.581 and 1.602 in the fecond part
of the Table, when the Food was lefs and
drier; and 1.302 and 1.292 in the firft
part of the Table, when the Food was
more and moifter. To make thefe Things
more evident, I compofed the following
Tables from Table 3 and Table 7. Thefe
Tables, in the Columns $\frac{du}{nu}$, $\frac{dp}{np}$, exhibit the

<div align="right">mean</div>

mean Quantities of Urine and Perfpiration drawn off hourly from the Blood in the Day, in Proportion to their mean Quantities drawn off hourly in the Night; and in the Columns $\frac{dp}{du}$, $\frac{np}{nu}$, exhibit the mean hourly Quantity of Perfpiration in Proportion to the mean hourly Quantity of Urine, drawn off from the Blood in the Day and in the Night, in the feveral Seafons of the Year.

TABLE 11. taken from TABLE 3.

Seafons.	A. D. 1721.				A. D. 1744-5.			
	$\frac{du}{nu}$	$\frac{dp}{np}$	$\frac{dp}{du}$	$\frac{np}{nu}$	$\frac{du}{nu}$	$\frac{dp}{np}$	$\frac{dp}{du}$	$\frac{np}{nu}$
Winter					0.870	1.348	1.059	0.688
Spring					0.811	1.299	1.192	0.744
Summer	1.427	1.302	1.289	1.413	1.175	1.581	1.063	0.790
Autumn	1.315	1.292	1.277	1.299	1.002	1.602	1.241	0.776
Mean	1.371	1.297	1.283	1.356	0.966	1.457	1.139	0.749

TABLE 12. taken from TABLE 7.

Seafons.	$\frac{du}{nu}$	$\frac{dp}{np}$	$\frac{dp}{du}$	$\frac{np}{nu}$
Spring	1.341	1.697	0.748	0.583
Summer	0.947	1.533	.202	0.742
Autumn	1.165	1.412	0.967	0.798
Winter	1.402	1.567	0.805	0.721
Mean	1.214	1.552	0.928	0.711

F

From the fecond part of Table 11, in which the Food was lefs in Quantity and drier, Perfpiration exceeded Urine in the Day, and fell fhort of it in the Night, at all Seafons of the Year ; whereas in the firft Part of this Table, where the Food was more in Quantity and moifter, Perfpiration exceeded Urine both Day and Night, in Summer and Autumn. From the fecond Part of Table 11 it appears, that Perfpiration and Urine are fo contrived by the great Author of Nature, that when one increafes the other leffens, both in different Parts of the natural Day, and in different Seafons of the Year ; by which wife Contrivance, grown Bodies, which do not ufe much Exercife, and take a proper Quantity of good Food, and rightly proportion the Meat to the Drink, will be little affected with the fenfible Qualities of the Air, and will continue of the fame Weight, and in good Health, at all Seafons. Other Perfons who live irregularly as to Diet, will fcarcely be able, as appears from what is faid in thefe Obfervations,

vations, to pafs the four Seafons without Diforders.

Obf. 7. In this Obfervation I fhall fhew how Perfpiration and Urine are affected by the Paffions of the Mind. Anger and Joy increafe, and Fear and Sadnefs leffen, both Perfpiration and Urine. The Soul, which has great Power over the Body by virtue of the Æther, when it is made un-eafy by the Paffion of Anger, raifes a ftrong vibrating Motion in the Æther within its *Senforium*, which Motion is propagated through the Nerves to all Parts of the Body. This ftrong Motion in the Membranes of the Heart quicken its Contraction and Dilatation, and thereby quicken the Contraction and Dilatation of the Blood-veffels and fecerning Ducts, and of confequence increafe the Difcharges of Perfpiration and Urine, and that more or lefs in proportion to the Strength and Continuance of the Paffion. I had one Inftance of this in *November* 1744, in which both Urine and Perfpiration were

increafed

increased confiderably by this Paffion, in
the Day and Night, from what they were
the Day and Night before. Joy affects thefe
Difcharges in like manner as Anger. In
the Paffions of Fear and Sorrow, Perfpi-
ration and Urine are leffened, by a Dimi-
nution of the vibrating Motion of the
Æther, occafioned by a Depreffion of the
Power of the Will and Activity of the
Soul, under thofe Paffions. Hence Joy
and Anger increafe, and Fear and Sorrow
leffen, Perfpiration and Urine, and the
Weight of the Body. And other Paf-
fions, as they partake of thefe, will af-
fect the Difcharges and Weight of the
Body in like manner. That the Soul has
an entire Power over the vibrating Mo-
tion of the Æther, may be gathered from
its moving the Limbs with various De-
grees of Velocity, and from its ftopping
and changing thofe Motions at pleafure;
and likewife from that infinite Variety of
mufical Sounds caufed by an infinite Va-
riety of Vibrations in the Air and Æther,
which can be produced by a fine Voice.

Confider-

Confidering the great Power the Soul
has over the Body in caufing and regula-
ting its Motions by the Æther, it may be
proper to explain the great Law by which
the Soul acts in this high Station. The
Soul, by its fenfitive and intelligent Na-
ture, knows and feels the Wants and Dif-
orders of the Body by the Senfations of
Uneafinefs and Pain, and perceives the
Removal of thofe Wants and Diforders
by the Senfations of Eafe and Pleafure.
Now fince all Uneafinefs may be reckon-
ed Pain, and all Eafe Pleafure, Pain and
Pleafure are the two great Senfations of
the Soul, which caufe it to excite fuch
Motions in the Æther of the Nerves, and
thereby fuch Motions in the feveral Parts
of the Body, as are fit to remove Pain,
and give Pleafure. Hunger and Thirft
are the painful Senfations whereby the
Soul is put upon raifing fuch Motions in
the Body as are neceffary to procure Meat
and Drink. And ftretching the Stomach
by too full a Meal creates a painful Senfa-
tion, whereby the Soul is urged to raife

F 3 fuch

fuch Motions in the Body as are neceflary
to free it from the Load ; accordingly, if
the Load arife from too much Drink, it
often hurries it out of the Body in pale
Urine, but if it arifes from too much
Meat, it commonly throws it off by Stool
or Sweat, oftener by Stool in weak Bo-
dies, and by Sweat in ftrong Bodies.

Obf. 8. The Proportion of Perfpiration
to Urine is increafed by all thofe Exer-
cifes which increafe the Motion of the
Blood, and warm the Skin ; as is proved
by Experiments in the *Animal Oeconomy*,
p. 280.

Obf. 9. In *January* and *February* of
Table 2, the daily Difcharge by Stool at
a Medium, was greater than in any of
the other Months; which was owing to a
Diarrhœa which began the 30th of *Ja-
nuary*, and continued four Days to the
3d of *February*. During this Difcharge,
which at a Medium was above two
Pounds a Day, Perfpiration and Urine
were both leffened, and with refpect to
their

their Quantities before this Difcharge began, the Decreafe of Urine was above double that of Perfpiration. For before the *Diarrhœa* began, the daily Quantities of Perfpiration and Urine were 27 and 30, and for the four Days of the Difcharge they were at a Medium 25 and 24 nearly. The Decreafe of Urine during the *Diarrhœa* was 6 Ounces a Day, and the Decreafe of Perfpiration 2; but $\frac{6}{30}$ is to $\frac{2}{27}$ as 162 to 60, that is as 2.7 to 1. The Matter of a *Diarrhœa* is fupply'd by Blood-veffels, which are nearer to the Blood-veffels of the Kidneys than they are to the Blood-veffels of the Skin. On which account, when the Difcharge by Stool is much increafed by a *Diarrhœa*, both Perfpiration and Urine are leffened, and Urine, from its being a nearer Difcharge as being fupply'd by nearer Blood-veffels, is leffened more than Perfpiration. And when a *Diarrhœa* ftops, Urine by the Stoppage of that Difcharge is more increafed than Perfpiration. All this neceffarily happens from the Nature and Laws of the Blood's Motion. The Truth

of

of this appears, when a *Diarrhæa* or *Dy-sentery* is stopped by large Quantities of plain Water, Barley Water, Ptisan, or Chicken Water, drank warm ; for as soon as the Pain abates, from the acrid Salts being diluted and carry'd off by Stool, the Water turns to the Kidneys, and passes off quick by Urine like Spa-water, which soon puts a Stop to the Discharge by Stool. One thing I must observe concerning the Discharge by Stool, that since I lessened my Drink, I have been much more costive than I was before. Costiveness generally attends dry Food in other Animals as well as Men.

Obs. 10. During the Course of Experiments from which I formed Table 2, the Morning Weight of my Body was continually changing, either increasing or decreasing. Sometimes it increased or decreased for some Mornings together, but then the whole Increase or Diminution never amounted to above 63 Ounces. In the beginning of *February* I gained 41 Ounces in six Days, having lost by a *Di-arrhæa*

arrhæa 63 Ounces in three Days before. Table 6 ſhews ſome of the moſt remarkable Changes of Weight, whether Increaſe or Diminution, which happened to me that Year, together with the Months, Days, and Quantities of Food taken on thoſe Days, in which the Changes happened. The Increaſe and Diminution of my Weight was commonly cauſed by an Increaſe and Diminution of my Food ; tho' I have known my Weight increaſed by Fruit and Garden Stuff ; when the whole Quantity of what was taken, was leſs than my ordinary Quantity of Food ; which was the Caſe on the 30th of *June.*

If the Increaſe of Weight in a ſmall Compaſs of Time, riſe to above a certain Quantity, it will be apt to cauſe Diſorders. I can bear an Increaſe of above a Pound and a half in one Day, and an Increaſe of three or four Pounds in ſix or ſeven Days, without being diſordered ; but am apt to think that I ſhould ſuffer from an Increaſe of five or ſix Pounds in that Time. An Increaſe of Weight may

be

be carry'd off by leffening the Food, or
by increafing the Difcharges; and the
Difcharges may be increafed either by
Exercife, or by Evacuations procured by
Art.   By leffening the daily Quantity of
my Food to 23 Ounces, I have loft 26
Ounces; by fafting a whole Day laft
Month, I loft 48 Ounces, having gained
27 the Day before; and by fafting a
whole Day this Month I have loft 42
Ounces, having gained 7 Ounces the Day
before.   I am not able to ufe much Ex-
ercife at prefent, but have fhewn from
Experiments in the *Animal Oeconomy* how
much a Body may lofe by Exercife. Mr.
Rye, who was a ftrong well-fet corpulent
Man of a fanguin Complexion, by a brifk
Walk for one Hour before Breakfaft,
threw off by infenfible Perfpiration one
Pound of increafed Weight; and by a
Walk of three Hours, he threw off two
Pounds of increafed Weight. I have loft
by a fpontaneous *Diarrhœa* two Pounds
in twenty-four Hours; and Mr. *Rye* loft
twice that Quantity in the fame Time.
A ftrong purging Medicine may leffen the
                                    Weight

Weight of a grown Body about two or three Pounds, as I have ſhewn in the *Animal Oeconomy.* The beſt way to take off an Increaſe of Weight which threatens a Diſtemper, is either by Faſting or Exercie. But nothing, amidſt a Variety of diſturbing Cauſes, will be able ſo effectually to prevent ſuch an Increaſe of Weight as ſhall cauſe a Diſtemper, as a very exact and regular Diet which can keep the Body of a right Weight, and prevent the Diſcharges from running into Irregularities, and Diſproportions to one another.

Obſ. 11. The ſpecifick Gravity of my Urine in Table 2, was greater in the Night than in the Day, when I was in Bed than when I was up. Hence we learn, that Urine draws off more Contents from the Blood in Sleep than when Bodies are awake; and conſequently, that natural Sleep is a very good Sign in Fevers, in which the Blood abounds more with Contents than it does in Health.

<div align="right">*Obſ.*</div>

Obs. 12. According to Dr. *Lining*, the sickly Months in *Charles-Town* at *South Carolina*, are *July*, *August*, and *September*. The Heat of the Air in each of those Months, is greater than its Heat in any other Month except *June*, as may be seen in Table 9 ; and the mean Heat in those three Months, is greater than the Meridian Heat of the Air in *England* in the Month of *July*, which by *Newton*'s Scale is 6, in the Proportion of 8.63 to 6, or 863 to 600.   And the mean Quantities of Rain, and Moisture in the Air, are each of them greater in those three Months than in the three preceding Months.   Hence it seems very reasonable to conclude, that the Sicklinefs at that Season is caused by the Heat, and Moisture of the Air ; for Bodies are more disposed to Putrefaction in a hot and moist Air, than in a cold and dry Air.   Perhaps it may be asked, Since the Air in *South Carolina* is much hotter than it is in *England* and *Ireland*, and even in *Italy*, where

it

it is much hotter than in thefe Countries,
why *Lining*'s yearly Perfpiration fell fhort
of his yearly Urine, taking one Month of
the whole Year with another, when in
Sanctorius and *Rye* Perfpiration exceeded
Urine at all Seafons of the Year ? To
this may be anfwered, That though the
Air is hotter in *South Carolina* than in the
Countries I have mentioned, and on that
account draws the Moifture of the Body
more to the Skin, and increafes Perfpira-
tion ; yet both the Quantity and diuretic
Quality of the Drink are much greater in
South Carolina than in the aforefaid Coun-
tries, which may make it to pafs off in a
greater Quantity by Urine than by Perfpi-
ration ; for a large Quantity of Drink of
a diuretic Nature commonly paffes off
very quick by Urine. The Drink com-
monly ufed in Summer in *Charles-town* is
a weak Punch thus made : Take of Wa-
ter 2 Troy Pounds, of Sugar $1\frac{1}{2}$ Ounce,
of recent Lime-juice $2\frac{1}{2}$ Ounces, of Rum
$3\frac{1}{2}$. M. That which is ufed in Autumn
and Winter is richer, having more Sugar
and Rum, and lefs Acid. And if the
<div align="right">Moifture</div>

Moisture of the Air be greater there than in these Countries and in *Italy*, that may likewise contribute to lessen Perspiration, and promote Urine, by *Obs.* 4. *Keill's* Urine exceeded his Perspiration in all Months of the Year except *August*, in which Month Perspiration was nearly equal to Urine, only a little larger, as appears from Table 7. He often drank Punch, and was much on Horseback; both of which promote Urine much more than they do Perspiration, as appears by common Experience. Whether any other Cause contributed to produce this Effect in Dr. *Keill's* Discharges I can ot tell, not having known him, and being wholly unacquainted with his Constitution. One Thing indeed, besides those already mentioned, I am satisfied, is much concerned in fixing the Proportion of Perspiration to Urine, and that is, the Force of the Heart in proportion to the attractive Power of the Kidneys. For a weaker Heart, or Kidneys stronger either naturally or by Irritation, may lessen the Proportion

of

of Perſpiration to Urine, and on the contrary.

Obſ. 13. The Sum of Perſpiration and Urine drawn off hourly from the Blood, is greater in the Day than in the Night, in the Time of being up than in the Time of being in Bed, as appears from Table 3, and the Tables of *Keill* and *Lining.* Hence, when the Food is the ſame, as to Quantity, Quality, and the Proportion of the Meat to the Drink, and the Exerciſe likewiſe the ſame ; thoſe Bodies will be apt to gain moſt in their Weights which get moſt Sleep ; which agrees with Experience. For much Sleep, much Food, and little Exerciſe, are the principal Things which increaſe the Weight of the Body, and make Animals grow fat. Conſequently, if the Weight of the Body be too great for good and uninterrupted Health, it may be leſſened by leſſening the Sleep and Food, and by increaſing the Exerciſe. And if the Body, on account of Age or other Infirmities, cannot uſe any Exerciſe of Conſequence, and takes

2 much

much the fame Quantity of Sleep, its
Weight muft be leffened by leffening its
Food, which may be done by leffening
the Drink, without making any Change
in the Meat; as I have found by Expe-
rience in myfelf.   For my Exercife now
being very inconfiderable, and of little Con-
fequence with regard to the Change of
my Weight, and the Quantity of found
Sleep being now fix or feven Hours, which
is much the fame as formerly; the Dimi-
nution of my Weight ought wholly to
be attributed to the Diminution of my
Food, which confifted chiefly in leffening
the Quantity of my Drink.   I go to Bed
early, and rife early, and have done fo
the greateft part of my Life.   On the
contrary, if the Weight of the Body be
too little for good and uninterrupted
Health, it may be increafed by increafing
the Food and Sleep, and by leffening the
Exercife; and the Food muft be increafed
chiefly by increafing the Drink and liquid
Nourifhment.   For the Difcharges are or-
dinarily lefs from Drink and a liquid Nou-
rifhment,

rifhment, than from dry and folid Food;
as I have fhewn above.

Obf. 14. By Table 9, Dr. *Lining's*
Weight was confiderably lefs in hot Wea-
ther than in cold. He fell away in *April*,
May, *June*, *July*, *Auguft*, and *September*,
and loft in thofe fix Months above fif-
teen Averdupois Pounds, which he gained
again, and near a Pound and a half more,
in *October*, *November*, *December*, and *Ja-
nuary*. It is to be obferved that the fickly
Months in that hot Climate, were fome
of thofe in which he fell away. See *Sanct.
Aph.* 54, 55, 56. *Sect.* 2.

Obf. 15. There is but one Weight un-
der which a grown Body can enjoy the
beft and moft uninterrupted Health; and
that Weight muft be fuch, that Perfpira-
tion and Urine may be nearly equal at all
Seafons of the Year; for by this Means
the Body will be uniformly drain'd of its
Moifture, the inward Parts by Urine, and
the more fuperficial Parts by Perfpiration,
without any irregular and unnatural Dif-

G . charges,

charges, and its Morning Weight will continue nearly the same at all Seasons of the Year. This Weight may be settled by the preceding Observations.

Obf. 15. " In the Winter, when the
" Perspiration of an unexercised Person is
" only equal to the Urine, the Diet for
" twenty-four Hours ought not to exceed
" four Pounds or four Pounds and a half.
" In Summer the Diet may be six Pounds
" and a half, which may be carry'd off
" without the Help of Exercise when
" the Air is hot and dry. *Rye, Aph.* 25,
" 26. If the Meat and Drink of one
" Day be four Pounds and a half, the
" Perspiration of that Day will be two
" Pounds, the Urine two Pounds and
" five Ounces, and the Stool three Ounces.
" From about four Pounds of Food the
" Body daily returns to the same Weight;
" but from a lesser Quantity of Food the
" Weight of the Body lessens, and from
" a greater Quantity it increases." *Keillei*
Obf. unius anni, p. 17. By comparing these Aphorisms and Observations with
what

what I faid above concerning my own
Food, we may allow the Quantity of
Food that is neceffary to preferve a grown
Perfon, who ufes but little Exercife, con-
ftantly in good Health, to be pretty right-
ly determined in the Column F of Table
1. p. 10. For that Quantity of good
Food will keep the Difcharges of Perfpi-
ration and Urine equal, and the Morning
Weight of the Body the fame at all Sea-
fons of the Year. Hence we may judge
of the healthful Quantity of Food ; for if
the Quantity of Food be fuch as to make
the Perfpiration and Urine of a natural
Day always nearly equal, and the Morn-
ing Weight of the Body always nearly
the fame, that Quantity is the truly health-
ful Quantity of Food for grown Bodies,
who ufe but little Exercife.

Obf. 16. The Quantity of Food necef-
fary to keep a grown Body in Health, will
be better and more eafily digefted when it
is fo divided as to make the Meals equal,
than when it is fo divided as to make
them very unequal. For inftance ; if

three

three Pounds of Food is to be taken in
a Day at three Meals, it will be better to
take a Pound at each Meal, than to take
two Pounds at one Meal, and half a
Pound at each of the other two; and if
the same Quantity of Food is to be taken
at two Meals, it will be better to take a
Pound and a half at each Meal, than to
take two Pounds at one Meal, and one
Pound at the other.   And as to the Di-
stance between one Meal and another, it
ought ever to bear some Proportion to the
Largeness of the preceding Meal; for in-
stance, if three Meals be taken in a Day,
they may be taken at the Distance of eight
Hours from each other, and at the Di-
stance of twelve Hours if only two Meals
be taken in a Day. But though the Food
be equally divided between the Meals, yet
there ought to be some Difference in the
Distances between them; for Perspiration
and Urine being drawn off from the Blood
more slowly in the Night than in the Day,
the Distance between Supper and Break-
fast next Morning, ought to be greater
than the Distance between Breakfast and
Dinner,

Dinner, or between Dinner and Supper. *N. B.* Perfons who are fubject to Difor- ders of the Head, ought not to take any Food at Night.

If the Quantity of Food be given, its Quality will caufe a Difference in the Time of digefting; for inftance, flimy and vifcid Meats are longer in digefting in the Stomach than Meats of a contrary Nature; the Flefh of fome young Ani- mals is not fo foon digefted as the Flefh of the fame Animals arrived at their full Growth; thus Veal and Lamb are not fo foon digefted as Beef and Mutton. A Man who took a Vomit every fecond Night for fome Months, obferved, that when he had taken Chicken for Dinner, he always threw it up undigefted, but ne- ver threw up any of his Food undigefted when he had made his Dinner on Beef or Mutton.

I now proceed to illuftrate what has been faid, by Obfervations drawn from Experiments made on other Animals.

Obser-

OBSERVATIONS *drawn from Experiments made on other Animals.*

THE following Tables exhibit the mean Weights of the Bodies, Hearts, and Livers, of feveral Species of Birds and Fifhes whofe Names are fet down in the firft Column. The mean Weights of the Bodies, Hearts, and Livers, in Grains, are fet down in the Columns W, H, and L; and the Proportion of the Heart and Liver to the Weight of the Body, and of the Liver to the Weight of the Heart, are fet down in the Columns $\frac{H}{W}$, $\frac{L}{W}$, and $\frac{L}{H}$. Many of the Numbers are Means taken from ten Experiments, as were moft of the Numbers of the Fifhes; but fome of the Numbers of the Birds were Means taken from a leffer Number of Experiments. The Heart was cleared from all Appendages of Fat and large Veffels, and was only the bare Mufcle of the Heart; the Liver was without the Gall-Bladder; and in Birds the Weight of the Body was its Weight without Feathers.

TABLE

T A B L E I.

Wild Birds.	W	H	L	$\frac{H}{W}$	$\frac{L}{W}$	$\frac{L}{\sqrt{H}}$
Cock green Linnets	352	5.9	7.9	$\frac{1}{59}$	$\frac{1}{44}$	1.34
Hen green Linnets	396	5.9	11.5	$\frac{1}{67}$	$\frac{1}{34}$	1.95
Cock Sparrows	427	6.3	19.5	$\frac{1}{68}$	$\frac{1}{22}$	3.10
Hen Sparrows	404	5.6	19.0	$\frac{1}{72}$	$\frac{1}{21}$	3.39
Cock Teals	7000	76.0	122.0	$\frac{1}{92}$	$\frac{1}{57}$	1.60
Hen Teals	5080	56.0	144.0	$\frac{1}{91}$	$\frac{1}{35}$	2.57
Mallards	16796	157.0	360.0	$\frac{1}{107}$	$\frac{1}{46}$	2.29
Ducks	15143	129.0	343.0	$\frac{1}{117}$	$\frac{1}{44}$	2.66
Mean of the Male Wild Birds	6144	61.3	127.3	$\frac{1}{100}$	$\frac{1}{48}$	2.08
Mean of the Female Wild Birds	5256	49.1	129.4	$\frac{1}{107}$	$\frac{1}{40}$	2.63
Mean of the whole Wild Birds	5700	55.2	128.3	$\frac{1}{103}$	$\frac{1}{44}$	2.32

TABLE 2.

Tame Birds.	W	H	L	H/W	L/H	L/H
Cock Pigeons young ———	3003	29	126	$\frac{1}{103}$	$\frac{1}{24}$	4.34
Hen Pigeons young ———	2908	27	128	$\frac{1}{108}$	$\frac{1}{23}$	4.74
Cocks, game, 2¼ Years old—	25674	159	410	$\frac{1}{161}$	$\frac{1}{62}$	2.58
Hen Chickens, game, 9 Weeks old	6064	34	239	$\frac{1}{178}$	$\frac{1}{25}$	7.03
Drakes ———	17884	117	468	$\frac{1}{153}$	$\frac{1}{5}$	4.00
Ducks ———	16714	103	426	$\frac{1}{152}$	$\frac{1}{39}$	4.13
Barn-door Cocks, old ———	17594	84	360	$\frac{1}{278}$	$\frac{1}{49}$	4.28
Barn-door Hens, old ———	19315	63	508	$\frac{1}{307}$	$\frac{1}{58}$	8.06
Barn-door Cocks, young ———	21087	105	433	$\frac{1}{201}$	$\frac{1}{49}$	4.12
Barn-door Hens, young ———	21889	52	454	$\frac{1}{42}$	$\frac{1}{48}$	8.73
Cock Chickens ———	12380	47	412	$\frac{1}{263}$	$\frac{1}{30}$	8.77
Hen Chickens ———	10046	34	328	$\frac{1}{295}$	$\frac{1}{31}$	9.65
Cram'd Cocks ———	21065	92	673	$\frac{1}{217}$	$\frac{1}{31}$	7.31
Cram'd Hens ———	23990	60	1037	$\frac{1}{400}$	$\frac{1}{23}$	17.28
Mean of the Male Tame Birds	16942	90	412	$\frac{1}{98}$	$\frac{1}{41}$	4.58
Mean of the Female Tame Birds	14418	53	446	$\frac{1}{272}$	$\frac{1}{32}$	8.41
Mean of the whole Tame Birds	15680	72	429	$\frac{1}{218}$	$\frac{1}{36}$	5.96

T A B L E 3.

Round Fish.	W	H	L	$\frac{H}{W}$	$\frac{L}{W}$	$\frac{L}{H}$
Male Mackarels ——	7054	10.4	125	$\frac{1}{678}$	$\frac{1}{56}$	12.0
Female Mackarels ——	7579	11.2	223	$\frac{1}{677}$	$\frac{1}{34}$	19.9
Male Salmon Trouts ——	8925	11.4	164	$\frac{1}{783}$	$\frac{1}{54}$	14.4
Female Salmon Trouts ——	9074	10.6	131	$\frac{1}{856}$	$\frac{1}{69}$	12.3
Male Salmons ——	54614	62.5	795	$\frac{1}{873}$	$\frac{1}{69}$	12.7
Female Salmons ——	72095	70.4	1046	$\frac{1}{1024}$	$\frac{1}{67}$	14.8
Male Herrings ——	2489	2.2	11.2	$\frac{1}{1131}$	$\frac{1}{222}$	5.1
Female Herrings ——	2298	2.2	34.6	$\frac{1}{1045}$	$\frac{1}{62}$	15.7
Male River Trouts ——	4150	3.7	57	$\frac{1}{1122}$	$\frac{1}{73}$	15.4
Female River Trouts ——	3847	3.1	62	$\frac{1}{1241}$	$\frac{1}{62}$	20.0
Male Cods ——	90871	67.0	2070	$\frac{1}{1356}$	$\frac{1}{44}$	30.9
Female Cods ——	112044	84.7	3465	$\frac{1}{1323}$	$\frac{1}{32}$	40.9
Male Whitings ——	3281	2.3	102	$\frac{1}{1426}$	$\frac{1}{52}$	44.3
Female Whitings ——	3661	2.4	82	$\frac{1}{1525}$	$\frac{1}{44}$	34.2
Mean of the Male Round Fish ——	24483	22.8	475	$\frac{1}{1074}$	$\frac{1}{52}$	20.8
Mean of the Female Round Fish ——	30085	26.4	720	$\frac{1}{1139}$	$\frac{1}{42}$	27.3
Mean of the whole Round Fish	27284	24.6	598	$\frac{1}{1109}$	$\frac{1}{46}$	24.3

TABLE 4.

Flat Fish.	W	H	L	$\frac{H}{W}$	$\frac{L}{W}$	$\frac{L}{H}$
Male Turbuts	26090	12.00	311	$\frac{1}{2174}$	$\frac{1}{84}$	25.9
Female Turbuts	36400	15.26	460	$\frac{1}{2335}$	$\frac{1}{72}$	30.1
Male Brets	10157	4.37	132	$\frac{1}{2324}$	$\frac{1}{77}$	30.2
Female Brets	14745	5.80	110	$\frac{1}{2542}$	$\frac{1}{134}$	19.0
Male Plaices	16505	6.25	232	$\frac{1}{2641}$	$\frac{1}{71}$	37.1
Female Plaices	20979	9.14	276	$\frac{1}{2295}$	$\frac{1}{76}$	30.2
Male Flounders	2178	0.93	33	$\frac{1}{2342}$	$\frac{1}{66}$	35.5
Female Flounders	4396	2.08	122	$\frac{1}{2113}$	$\frac{1}{36}$	58.6
Male Soles	6557	2.59	51	$\frac{1}{2532}$	$\frac{1}{129}$	19.7
Female Soles	6887	2.79	58	$\frac{1}{2478}$	$\frac{1}{119}$	20.8
Mean of the Male Flat Fish	12297	5.25	152	$\frac{1}{2351}$	$\frac{1}{81}$	29.0
Mean of the Female Flat Fish	16681	7.01	205	$\frac{1}{2380}$	$\frac{1}{81}$	29.2
Mean of the whole Flat Fish	14489	6.12	178	$\frac{1}{2367}$	$\frac{1}{81}$	29.1

OBSERVATIONS *on the Tables of Animals.*

Obf. 1. THE Weight of the Heart in proportion to the Weight of the Body, is greater in wild Birds than in tame Birds. The former ufe more Exercife, or move their Mufcles more, than the latter; and from the different Quantities of Motion in the Mufcles of wild Birds and tame, we may fee the Reafon why the Weight of the Heart in proportion to the Weight of the Body, is greater in the former than in the latter. When a Mufcle moves, it contracts and dilates alternately, in like manner as the Heart. In its Contraction it empties itfelf, as the Heart does in its Syftole, preffing the Blood forward towards the Heart with greater or leffer Force, in proportion to the Strength of the Contraction. And in its Dilatation the Mufcle fills again, as the Heart does in its Diaftole, with Blood fent into it by the Force of the Heart.

Now

Now if many and large Muſcles be moved, it is evident that much more Blood will flow to the Heart during the Time of their Motion, than did before in an equal Time when the Muſcles were at Reſt. And the Heart, to prevent an Oppreſſion from an Overload of Blood, is made to quicken its Motion in order to ſend back the Blood as faſt as it is thrown upon it by the Motion of the Muſcles. Hence the Motions of the Heart and Blood are much increaſed by much Motion of the Muſcles. On the contrary, when the Quantity of Motion in the muſcular Syſtem is greatly diminiſhed by the Inactivity of Bodies, the Force of the Heart and Motion of the Blood will likewiſe be diminiſhed in the ſame Proportion. But Muſcles which are much moved always increaſe in Magnitude, Weight, and Strength ; and yet Bodies which uſe much muſcular Motion, are ſeldom obſerved to grow fat or increaſe in Weight. And therefore the Weight of the Heart in proportion to the Weight of the Body will be greater in wild Animals than in tame, in

Bodies

Bodies which ufe much Exercife than in Bodies which are inactive.

Hence Animals which ufe much Exercife have a greater Appetite, and require more Food than Animals which are inactive. For the Appetite is proportional to the Sum of the Difcharges, and the Sum of the Difcharges is proportional to the Motion of the Blood, by *Prop.* 2. Which Motion being greater in Animals which ufe much Exercife than in Animals which are inactive, the Appetite to Food will of Confequence be fo too.

Obf. 2. The Weight of the Heart in proportion to the Weight of the Body, is greater in fmall Birds than in large ones, it is greater in a Sparrow than in a Goofe. It is likewife greater in a Moufe than in an Ox, in a Child than in a Man, and probably greater in little Men than in large Men. This Proportion expreffed by $\frac{H}{W}$, in a ftrong healthful Man, in a ftrong Child newly born, in an Ox, in a Hare,

<div align="right">and</div>

and in a Mouſe, has been found by Experiment to be equal to $\frac{1}{240}$, $\frac{1}{160}$, $\frac{1}{248}$, $\frac{1}{110}$, and $\frac{1}{167}$. Now ſince ſmall Animals are generally more ſprightly and active than great Animals, we may allow the Sprightlineſs and Activity of a Body to depend much upon the Proportion of the Weight of the Heart to the Weight of the Body.

Obſ. 3. The Proportion of the Weight of the Heart to the Weight of the Body is leſs in fat Bodies than in lean. It is leſs in tame Birds than in wild Birds, and in cram'd Fowl than in Barn-door Fowl; and tame Birds are commonly fatter than wild Birds, and cram'd Fowl fatter than Barn-door Fowl. Butchers obſerve the ſame of Beaſts, that the fatter a Beaſt is, the leſs is its Heart. Now as Animals grow fat, the Weights of their Bodies increaſe, and their Quantities of Blood and Weights of their Hearts leſſen; for the Fat in the Membranes compreſſes the Blood-veſſels, and leſſens the Quantity of Blood; and as that leſſens, the Weight of

the

the Heart leſſens, the Weight of the Heart and Quantity of Blood always decreaſing and increaſing together. And therefore, the Weight of the Heart in proportion to the Weight of the Body is leſs in fat Bodies than in lean Bodies. The Motion of the Blood, as well as its Quantity, is leſs in fat Bodies than in lean, by *Cor.* 3. *Prop.* 12. *Anim. Oecon.* And hence we may account for fat Bodies having a leſſer Appetite than Bodies which are lean; for the Appetite is regulated by the Sum of the Diſcharges, and the Sum of the Diſcharges is regulated by the Motion of the Blood, which Motion being leſs in fat Bodies than in lean, the Appetite will of conſequence be ſo too.

Obſ. 4. The Weight of the Heart in proportion to the Weight of the Body, is greater in the Males than in the Females of Birds both wild and tame; and the Difference of this Proportion in the Males and Females of wild Birds, is leſs than its Difference in the Males and Females of tame Birds. This Proportion in the Males and

and Females of wild Birds, is $\frac{1}{100}$ and $\frac{1}{107}$ in Table 1; and in the Males and Females of tame Birds, it is $\frac{1}{188}$ and $\frac{1}{272}$ in Table 2. But $\frac{1}{100}$ is greater than $\frac{1}{107}$, and $\frac{1}{188}$ is greater than $\frac{1}{272}$; and the Difference between $\frac{1}{100}$ and $\frac{1}{107}$ is considerably lefs than the Difference between $\frac{1}{188}$ and $\frac{1}{272}$. Now by *Obf.* 1. the Weight of the Heart in proportion to the Weight of the Body is increafed by Exercife. But the Males of Birds, from their greater Activity and Strength, ufe more Exercife than the Females. And therefore the Weight of the Heart in proportion to the Weight of the Body, is univerfally greater in Male Birds than in Female Birds, both wild and tame. This Proportion differs lefs in the Males and Females of wild Birds, than it does in the Males and Females of tame Birds: For the Males and Females of wild Birds probably exercife much alike, and are nearly equal in Fatnefs; but the Males and Females of tame Birds differ more both in their Exercife and Fatnefs; for the Males exercife more, and are remarkably lefs fat than the Females, as

appears

appears from Obſervation. And therefore the Difference of this Proportion is leſs in the Males and Females of wild Birds, than in the Males and Females of Birds which are tame.

What has been ſaid concerning this Proportion in the Males and Females of wild and tame Birds, holds equally true in the Males and Females of wild and tame Beaſts.

Obſ. 5. The Weight of the Heart in proportion to the Weight of the Body is much greater in Birds than in Fiſh. This Proportion at a Medium in the whole of wild and tame Birds, is $\frac{1}{168}$ by Tables 1, 2; and in the whole of round and flat Fiſh, it is $\frac{1}{1320}$ nearly, by Tables 3, 4. Conſequently, this Proportion is greater in the whole of the Birds, than in the whole of the Fiſh, in the Proportion of above 8 to 1. This great Difference in the Proportion of the Weight of the Heart to the Weight of the Body in Birds and Fiſh, is owing to the great Difference

H of

of the Heat of the Blood in thefe two kinds of Animals, the Heat of the Blood being much greater in the former than in the latter. For a greater Degree of Heat in the Blood, will fwell and enlarge the Capacity of the Syftem of Blood-veffels, and make it bear a greater Proportion to the Weight of the Body than a leffer Degree of Heat. But the Force of the Heat in Animals is ever proportional to the Capacity of the Syftem of Blood-veffels. And therefore the Force of the Heart with refpect to the Weight of the Body will be greater in Birds than in Fifh; that is, putting Æ for the Strength of the vibrating Motion of the Æther in the Heart, $\frac{\text{Æ H}}{\text{W}}$ will be greater in Birds than in Fifh; by *Cor.* 5. *Prop.* 8. *Anim. Oecon.*

The Heat of the Blood of Animals, is caufed by the volatile Acid of the Air mixing with it in the Lungs by means of Refpiration; and is greater or leffer in proportion to the Quantity of this enlivening Spirit received into the Blood in a

I   given

given Time. And therefore, the Heat of the Blood is much greater in Birds than in Fifh, as the former in a given Time receive much more of this enlivening Spirit into their Blood by Refpiration than the latter.

Obf. 6. The Proportion of the Weight of the Heart to the Weight of the Body, is greater in round Fifh than in flat Fifh. The Mean of this Proportion in round Fifh and flat Fifh was $\frac{1}{1100}$ and $\frac{1}{2367}$ in Tables 3, 4. This Difference in the Proportion of the Weight of the Heart to the Weight of the Body in round Fifh and flat Fifh, may be owing to a Difference in their Refpiration and Exercife. For round Fifh often rife to the Surface of the Water to take in Air, a Thing rarely obferved of flat Fifh, which ftay for the moft part at the bottom of the Water.

Obf. 7. The Proportion of the Weight of the Liver to the Weight of the Heart is lefs at a Medium in wild Birds than in tame Birds, and in round Fifh than in flat Fifh. It is 2.32 and 5.96 in wild and

tame

tame Birds; and 24.3 and 29.1, in round
and flat Fiſh. Hence we learn, that thoſe
Things which increaſe or leſſen the Pro-
portion of the Weight of the Heart to
the Weight of the Body, do at the ſame
time leſſen or increaſe the Proportion of
the Weight of the Liver to the Weight
of the Heart. And conſequently, when
an Animal grows fat from much Food,
much Sleep, and little Exerciſe, its Heart
leſſens and its Liver increaſes; and on the
contrary, when an Animal grows lean
from little Food, little Sleep, and much
Exerciſe, its Heart increaſes, and its Liver
leſſens. There is but one Weight of the
Heart of a grown Body, under which
Weight the Body enjoys the beſt and moſt
uninterrupted Health, and that Weight is
ſuch as enables the Heart to ſupply the
ſeveral Parts of the Body with juſt Quan-
tities of Blood, ſuch as can preſerve the
due Magnitudes of the Parts, and there-
by hinder them from diſturbing the Offices
of one another. When the Weight of the
Heart is too little for the Weight of the
Body, the Liver enlarges beyond its juſt
Magnitude,

Magnitude, and preffes too much on the contiguous Parts, particularly on the Stomach, Inteftines, and Diaphragm, and by that Preffure leffens the Capacities of the Stomach, Inteftines, and Thorax, whence the Appetite grows lefs, the periftaltic Motion lefs, and Refpiration more difficult and uneafy.

Obf. 8. The Weight of the Liver in proportion to the Quantity of Blood, is lefs at a Medium in wild Birds than in tame, and in round Fifh than in flat Fifh. For the Weight of the Heart and Quantity of Blood in all Animals are proportional to each other; and therefore, fince by *Obf.* 7. the Weight of the Liver in proportion to the Weight of the Heart is lefs in wild Birds than in tame Birds, and in round Fifh than in flat Fifh; the Weight of the Liver in proportion to the Quantity of Blood, will be lefs in wild Birds and round Fifh, than in tame Birds and flat Fifh.

Rickety Children have larger Livers, and lefs Hearts and lefs Blood, than Children in Health. They have lefs Hearts and lefs Blood than Children in Health, from too

H 3   full

full and too grofs a Diet, and too little Exercife; and they have larger Livers than Children in Health, from the Liver's always increafing in Weight, when the Weight of the Heart and Quantity of Blood leffen. In moft chronical Difeafes, the Liver is larger than in Health, as has been found by diffecting Bodies dying of thofe Diftempers; and it is more than probable, that the Weight of the Heart, and Quantity of Blood in thofe Diftempers, are both lefs than in Health; for moft chronical Difeafes arife from too much Food, and too little Exercife, both of which leffen the Weight of the Heart and Quantity of Blood, the firft by caufing Fatnefs, and the fecond by occafioning a Diminution of the Blood's Motion.

Hence when the Liver is grown too large by Intemperance and Inactivity, it may be leffened and brought to a healthful Magnitude by Temperance and Exercife. It may be emptied other ways by Art, but nothing can prevent its filling again, and confequently fecure good and conftant Health, but an exact Diet and Exercife.

Purging

Purging and Vomiting may leſſen the Liver, and reduce it to its juſt Magnitude; but theſe Evacuations cannot prevent its increaſing again, ſo long as Perſons live too fully and uſe too little Exerciſe. This can only be done by leſſening the Food and increaſing the Exerciſe. And if ſufficient Exerciſe cannot be uſed on account of Weakneſs or ſome other Cauſe, frequent Vomits may be ſubſtituted in its ſtead; for frequent Vomits as well as conſtant Exerciſe increaſe the Motion of the Blood. The Effects of Vomits on the Motion of the Blood, appear by the following Experiments. *By obſerving the Pulſe of ſeveral Men after taking a Vomit, it has been found, that ſo ſoon as a Man begins to grow ſick, his Pulſe becomes low, quick, and irregular, and in the Action of Vomiting is often ſo low as not to be felt; that in the Intervals between the Vomits, the Pulſe is ſtill low and quick, but not near ſo low and quick as in the Action of Vomiting; and that after the Operation is over, the Pulſe riſes gradually, and in the Space of half an Hour or an Hour, becomes fuller than it*

H 4   *was*

was before the Vomit was taken. Hence
we fee the Effects of Vomits on the Mo-
tion of the Blood, they leffen that Mo-
tion during the whole Time of their Ope-
ration, and almoft quite ftop it in the
very Action of Vomiting ; and after the
whole Operation is over, they increafe the
Motion of the Blood, fo as to make it
greater than it was before. And from
thefe Effects of Vomits on the Motion of
the Blood, we difcover their great Ufe-
fulnefs in the Cure of many Difeafes.

For Inftance, Vomits ftop Hæmorrhages
from fmall Veffels. For when a Blood-
veffel is opened, the Blood flows fafter
through that Veffel, and flower through all
the reft of the Veffels, than it did before, by
Prop. 19 *and* 45 *Anim. Oecon.* And there-
fore, all that is neceffary to ftop a Hæmor-
rhage from a fmall Veffel, is to ftop the
Motion of the Blood in that Veffel, and
increafe its Motion in all the other Veffels ;
and both thefe are done by Vomits, as
appears by the foregoing Experiments.

The increafing the Motion of the Blood
in all the other Veffels, will leffen the Mo-
tion

tion in the Veffel fupplying the Hæmor-
rhage, and thereby effectually prevent a
Return of the Difcharge. For the fame
Reafon, Vomits leffen immoderate Dif-
charges of the Glands, and Ulcers; for
they leffen the Motion of the Blood and
Humours in the Parts affected, by increa-
fing their Motion in all the other Parts.
By increafing the Blood's Motion, repeat-
ed Vomits with a proper Diet I have
found to be of great Service in difperfing
fcrophulous Tumours; which may be al-
lowed, when it is confidered that thefe
Tumours are moft incident to Children
and young Bodies, the Motion of whofe
Blood is flow; and that they often difap-
pear of themfelves when Bodies are grown
up, and their Blood has acquired a ftronger
Motion. When Obftructions arife from
too languid a Motion of the Blood, Vo-
mits are generally of ufe in removing
them. And when the Motion of the
Blood is too great, and Obftructions are
formed by Cold, in the manner explained
in p. 67. Vomits after large Bleeding will
be of great Service in removing them. In

fhort

ſhort Vomits, repeated according to the Nature and Obſtinacy of the Diſorder, are generally of Service in all Irregularities and Diſproportions of the Motions of the Blood and other Fluids in different Parts of the Body. The Safety as well as Uſefulneſs of frequently repeated Vomits, is evidently ſeen in Perſons at Sea, and in Women with Child. Perſons at Sea who are ſick, and vomit much, are commonly the better for it : And frequent Vomiting in Women with Child, is of Service as it prevents Abortion. As all Muſcles grow ſtronger by Exerciſe, ſo the muſcular Coat of the Stomach grows ſtronger by Vomiting.

Obſ. 9. Since fat Animals have larger Livers, and leſs Hearts and leſs Blood, than lean Animals; it is evident, that when a fat Animal grows lean, its Fat and Liver leſſen, and its Heart and Blood increaſe; and on the contrary, that when a lean Animal grows fat, its Fat and Liver increaſe, and its Heart and Blood leſſen. Hence, when a fat Animal grows lean, it

firſt

firſt loſes its Fat, and afterwards, when its
Fat is waſted, if it ſtill goes on to loſe in
Weight, the Loſs then falls on the Heart
and Blood ; and when a lean Animal grows
fat, it firſt gains Fleſh and Blood, and af-
terwards, when the Fleſh and Blood are
increaſed to certain Magnitudes, it then
begins to get Fat. So that Animals on
the Waſte, firſt loſe their Fat, and after-
wards their Fleſh and Blood; and Animals
on the Gain firſt get Fleſh and Blood, and
then Fat. Farther, Animals on the Waſte,
firſt fall away in their Limbs, and after-
wards in their inward Parts ; and Animals
on the Gain, firſt gain in their inward Parts,
and then in their Limbs.

Obf. 10. The Weight of the Body un-
der which an Animal has the greateſt
Strength and Activity, which I ſhall call
its *athletic Weight*, is that Weight under
which, the Weight of the Heart, and the
Proportion of the Weight of the Heart to
the Weight of the Body, are greateſt. The
Strength of an Animal is meaſured by the
Strength of its Muſcles, and the Strength

of

of its Muſcles is meaſured by the Strength
of its Heart; and the Activity of an Ani-
mal is meaſured by the Weight of the
Heart in proportion to the Weight of the
Body; that is, the Strength and Activi-
ty of an Animal are meaſured by H and
$\frac{H}{W}$. And therefore, the Strength and Acti-
vity of an Animal will be greateſt, when
H and $\frac{H}{W}$ are greateſt.

If the Weight of the Body of an Ani-
mal be greater than its *athletic Weight*,
it may be reduced to that Weight, by Eva-
cuations, dry Food, and Exerciſe. Theſe
leſſen the Weight of the Body by waſting
its Fat, and leſſening its Liver; and they
increaſe the Weight of the Heart by in-
creaſing the Quantity and Motion of the
Blood. And by leſſening W and increa-
ſing H, they will ſoon reduce the Animal
to its athletic Weight. Thus a Game
Cock in ten Days is reduced to his athle-
tic Weight, and prepared for Fighting.
If the Food, which with Evacuations and
Exerciſe, reduced the Cock to his athletic
<div align="right">Weight</div>

Weight in ten Days, be continued any longer, the Cock will not have that Strength and Activity which he had before under his athletic Weight; which may be owing to the Loſs of Weight going on after he arrives at his athletic Weight, and then falling on the Heart, Blood, and Muſcles, which muſt neceſſarily occaſion a Loſs of Activity and Strength. It is known by Experience, that a Cock cannot ſtand above 24 Hours at his athletic Weight, and that a Cock has changed very much for the worſe in 12 Hours. When a Cock is at the Top of his Condition, that is, when he is at his athletic Weight, his Head is of a glowing red Colour, his Neck thick, and his Thigh thick and firm; the Day after, his Complexion is leſs glowing, his Neck thinner, and his Thigh ſofter; and the third Day his Thigh will be very ſoft and flaccid. Four Game Cocks reduced to their athletic Weights were killed, and found to be very full of Blood, with large Hearts, large Muſcles, and no Fat. The athletic Weight of an Animal is a very dangerous Weight; by p. 67, and *Hipp. Aph.* 3.

Sect.

Sect. 1. Fevers and Apoplexies are the Diforders, which commonly happen to Animals under or near their athletic Weights. Horfes fed upon dry Food are much more fubject to Fevers and Apoplexies than Horfes fed upon Grafs ; and the former are much nearer their athletic Weights than the latter.

SINCE finifhing the above, the following curious and ufeful Experiment, made on a Cow within eight or ten Days of dropping her Calf, was communicated by a Friend.

                                              Grains.
Cow alive ————————————6461376
Lungs ————————————   42486
Liver————————————————   77964
Heart ———————————————   24528
                                           ————
Diameter of the Aorta = 1.9 Inch.

Bag with Calf and Liquor—735840
Calf ————————————————427488
Lungs ————————————   10950
Liver ————————————————   9965
Heart ————————————————   2628
                                           ————
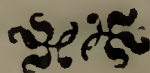Diameter of the Aorta = .8 Inch.

F I N I S.

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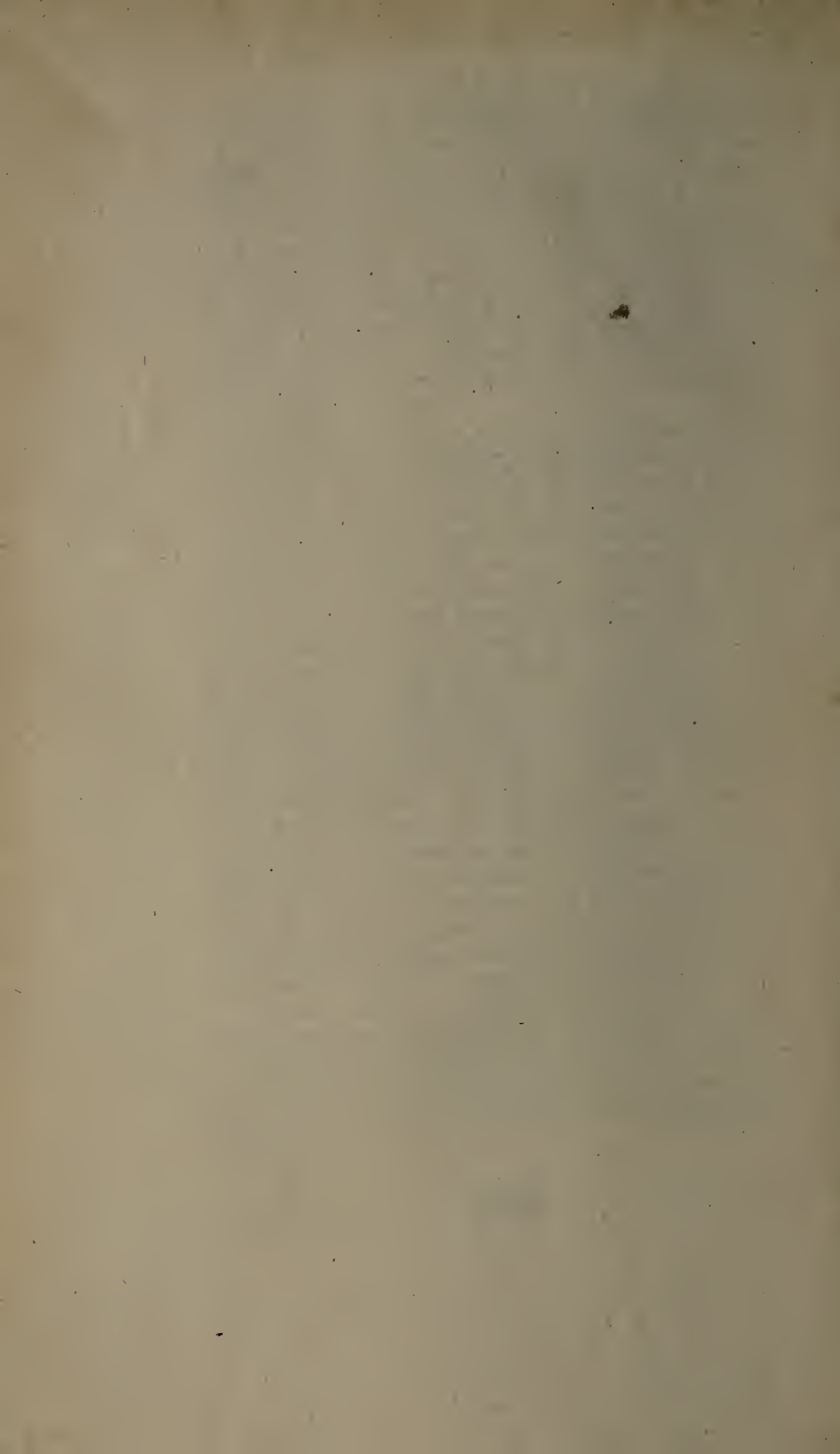
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